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Illinois State Academy of Science

Supplement to Volume 83

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83rd Annual Meeting
October 26-27, 1990

UNIVERSITY OF ILLINOIS
Urbana, Illinois

$2.00

PROGRAM AND ABSTRACTS
OF THE
ILLINOIS STATE ACADEMY OF SCIENCE

83RD ANNUAL MEETING

THEME:
HERBIVORY AND PLANT DEFENSES

UNIVERSITY OF ILLINOIS
URBANA, ILLINOIS

OCTOBER 26 – 27, 1990

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS 4

REGISTRATION INFORMATION 5
Accommodations 5
Parking 6
Food 6
Travel Information 6
Spouse's Activities 6
Field Trip 7
Cancellation Policy 7

MIDWEST SOCIETY OF ELECTRON MICROSCOPISTS, INC. 7

DEMONSTRATION/POSTER SESSION 8,24

SYMPOSIA 8

SUMMARY OF EVENTS 9

PAPER SESSIONS
Agriculture Division 10
Botany Division 10
Cell, Molecular and Developmental Biology 13
Chemistry/Collegiate Chemistry Division 14
Computer Science Division 17
Earth Science Division 17
Engineering and Technology Division 18
Environmental Science Division 18
Medical Science Division 19
Microbiology Division 20
Science, Mathematics and Technology Education . . . 20
Zoology Division 21

AUTHOR INDEX 26

ABSTRACTS 29

ROSTER OF OFFICIALS OF THE ILLINOIS STATE ACADEMY OF SCIENCE 63

FUTURE MEETINGS 66

CAMPUS MAP OF THE UNIVERSITY OF ILLINOIS 67

THE ILLINOIS STATE ACADEMY OF SCIENCE

WISHES TO THANK

THE FOLLOWING ORGANIZATIONS FOR CONTRIBUTING FUNDS

FOR THE 1990 ANNUAL MEETING

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ILLINOIS STATE ACADEMY OF SCIENCE
83RD ANNUAL MEETING

in conjunction with the

MIDWEST SOCIETY OF
ELECTRON MICROSCOPISTS, INC.

sponsored by

Department of Plant Biology
UNIVERSITY OF ILLINOIS
Urbana, Illinois

and

ILLINOIS NATURAL HISTORY
SURVEY
Champaign, Illinois

REGISTRATION

Participants are urged to pre-register for the ISAS Annual Meeting by returning the enclosed Registration Form with a payment of $15.00 ($7.50 for student members, $25.00 for non-members) to the Treasurer. The deadline for receipt of the pre-registration form is Friday, 19 October 1990. Tickets and name tags of pre-registrants can be picked up at the Registration Table on the first floor of the Levis Faculty Center, 919 West Illinois Street, Urbana, at the time of the meeting.

On-site registration will be conducted during the meeting. On-site registration is $20.00 ($10.00 for students, $30.00 for non-members).

Participants must register and have their ISAS name tag before they can participate in the ISAS meeting activities.

ACCOMMODATIONS

Motels and Hotels:

	single	double
Holiday Inn, Champaign I-74* 1505 N. Neil, Champaign (217) 359-1601	45.00	48.00
Comfort Inn 305 E. Marketvw Drive, Champaign (217) 352-4055	40.95	43.95
Red Roof Inn I-74, Exit 182-B and Neil, Champaign (217) 352-0101	29.95	37.95
Howard Johnson I-74 and US 45, Urbana (217) 367-8331	45.00	56.00
La Quinta 1900 Center Drive, Champaign 1-800-531-5900	45.00	51.00

* A block of rooms has been reserved at the Holiday Inn Champaign I-74 for meeting participants. Call (1-217-359-1601) to make your reservations. This block of rooms will be released to the public on 25 September 1990. Mention that you are an ISAS participant.

Camping: Camping is available at Homer Lake County Park (1-217-896-2455) and the Tincup Campers Park, Lake of the Woods Road, RR3, Mahomet, IL (1-217-586-3011).

PARKING

Parking around the campus of the University of Illinois is difficult as few parking spaces are available when classes are in session. Most of the parking spaces in university lots are reserved, and you will be ticketed and towed if you park in a reserved spot. Some guest parking spaces are available in these lots (there is a lot just south of the Levis Faculty Center), however, they are expensive, usually 25 cents for 1/2 to 1 hour (bring many quarters). Also, parking is available on the streets around the Levis Center, but again it is expensive.

FOOD

Food service is available on the University of Illinois campus in the University Union (two blocks west of the Levis Center). Numerous restaurants and fast food establishments are within easy walking distance from campus. A list of restaurants will be provided at the registration desk.

ISAS Luncheon: Friday, 26 October 1990, 12 noon, in the Levis Center. This will be a luncheon buffet, and will be followed by a symposium at 1:30 p.m. entitled "HERBIVORES AND PLANT DEFENSES" by faculty from the University of Illinois. Lunch tickets, $11.00 each, must be purchased by pre-registration.

ISAS Banquet: Friday, 26 October 1990, at 6:00 p.m., in the Levis Center. The banquet will be followed by a public lecture entitled "TICKS AND LYME DISEASE IN THE MIDWEST" moderated by Dr. Robert Novak of the Illinois Natural History Survey, Champaign, IL. Banquet tickets, $16.00 each, must be purchased by pre-registration.

TRAVEL INFORMATION

The University of Illinois, Champaign/Urbana, Illinois, is located in east-central Illinois. For those arriving by car, both I-57 and I-74 come close to Champaign/Urbana. If coming to Champaign by I-57, turn onto I-74 (east) and take the Lincoln Ave. exit south. The enclosed map may be used to get to the Levis Center. Champaign/Urbana is serviced by the Willard Airport, from which limousine service is available to the U. of I.

SPOUSE'S ACTIVITIES

No organized activities are planned for the meeting, but there are a number of sites of local interest at the University of Illinois that may be visited. A calendar of events will be available at the Registration Table.

OPTIONAL POST MEETING FIELD TRIP

A field trip has been arranged for Saturday, 27 October, 1990 to visit Trelease Woods, and Brownfield Woods, two prairie grove forests located near the University of Illinois campus. Participants should sign up on Friday for the field trip at the Registration Table where directions and other information will be available.

CANCELLATION POLICY

A full refund will be made if you cancel by noon, 19 October 1990.

MIDWEST SOCIETY OF ELECTRON MICROSCOPISTS, INC

The 1990 meeting of the Midwest Society of Electron Microscopists, Inc. is being held at the Beckman Institute, University of Illinois, about 4 blocks from the Levis Faculty Center.

The symposium is Friday afternoon, at 2 p.m. in the auditorium of the Beckman Institute. Map and program information will be available at the Registration Table.

"THE HISTORY AND STATE OF BIOLOGICAL ELECTRON MICROSCOPY"

Dr. Keith R. Porter; President of the Electron Microsopic Society of America, Professor of Biology, University of Pennsylvania

"Historical Developments in the Science of Biological Ultrastructure"

Dr. George D. Pappas; Professor of Anatomy, University of Illinois at Chicago

"The synapse 1950-1990: Where did we come from and where are we going?"

Dr. Robert P. Becker; Professor of Anatomy and Cell Biology, University of Illinois at Chicago

"Development, Current Trends, and Future Directions of Analytical Microscopy in Biology"

For more information about the Midwest Society of Electron Microscopists Meeting contact:

Dr. Richard Crang
Center for Electron Microscopy
University of Illinois
Urbana, Illinois
(217) 333-2108

DEMONSTRATION/POSTER SESSION

The posters will be available for viewing during the Wine and Cheese Social, 5:00 to 6:00 p.m., Friday (26 October), on the second floor of the Levis Center. Some may also be viewed during the Saturday (27 October) paper session. Abstracts of the demonstration/poster session are listed after the paper session abstracts in the program.

SYMPOSIA

HERBIVORES AND PLANT DEFENSES -- Friday, 1:30 p.m. -- Levis Center

Dr. May R. Berenbaum, Department of Entomology, University of Illinois

"Structure of the coevolutionary arms race: the wild parsnip and perestroika"

Dr. George Batzli, Department of Ecology, Ethology, and Evolution, University of Illinois

"Response of mammalian herbivores to plant defenses"

Dr. Conrad Labandeira, Department of Plant Biology, University of Illinois

"Feeding guilds and the fossil record of hexapod/vascular plant interaction"

Dr. David Seigler, Department of Plant Biology, University of Illinois

"Chemistry and herbivory: When did it begin and where is it going?"

TICKS AND LYME DISEASE IN THE MIDWEST -- Friday, 8:00 p.m. -- Levis Center

Moderator: Dr. Robert Novak, Center for Economic Entomolgy, Illinois Natural History Survey, Champaign, IL.

Speakers: Dr. Wayne Rowley, Department of Entomolgy, Iowa State University, Ames, IA.

Dr. Robert Pinger, Physical Health Science Department, Ball State University, Muncie, IN.

QUESTIONS

If you have any questions concerning the ISAS Annual Meeting contact:

Dr. David Seigler
Department of Plant Biology
University of Illinois
Urbana, Illinois 61801

Dr. John Ebinger
Botany Department
Eastern Illinois University
Charleston, Illinois 91920

SUMMARY OF EVENTS

FRIDAY, 26 October, 1990

8:30 a.m. - 4:00 p.m.	Registration - first floor, Levis Center
9:00 a.m. - 11:45 a.m.	Paper Sessions - Levis Center (see Program)
12:00 Noon - 1:30 p.m.	Luncheon Buffet* - Levis Center
1:30 p.m. - 5:00 p.m.	Paper Sessions - Levis Center (see Program)
1:30 p.m. - 4:00 p.m.	Symposium: "HERBIVORES AND PLANT DEFENSES" Levis Center Titles and abstracts available at the Registration Table
2:00 p.m. - 4:30 p.m.	"THE HISTORY AND STATE OF BIOLOGICAL ELECTRON MICROSCOPY" Auditorium, Beckman Institute Information available at the Registration Table
5:00 p.m. - 6:00 p.m.	Wine and Cheese Social Hour and Demonstration/Poster Session Levis Center
6:00 p.m. - 7:30 p.m.	ISAS Banquet* and Business Meeting Levis Center
8:00 p.m. - 9:30 p.m.	"TICKS AND LYME DISEASE IN ILLINOIS" Levis Center Open to the Public

****

SATURDAY, 27 October 1990

8:00 a.m. - 10:00 a.m.	Registration - entrance to the Levis Center
8:30 a.m. - 11:45 a.m.	Paper Sessions - Levis Center (see Program)
1:30 p.m.	Post Meeting Field Trip

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ALL PAPER SESSIONS WILL BE HELD AT THE LEVIS CENTER, UNIVERSITY OF ILLINOIS

* Luncheon and banquet tickets should be reserved at pre-registration, and will be issued at the registration desk; they will not be mailed. Only a limited number will be available at the registration desk on a first come basis.

AGRICULTURE DIVISION

DIVISION CHAIR:
Steven E. Kraft
Department of Agribusiness
Southern Illinois University
Carbondale, IL 62901

ROOM: 401

SESSION I - Friday, October 26

PRESIDING: Steven Kraft

TIME	PAPER #	
11:00 AM	1	ESTIMATING THE RELATIONSHIP BETWEEN THE SALE PRICE OF YOUNG BEEF BULLS AND ESTIMATED PROGENY DIFFERENCES. K.A. Sickmeyer, P.R. Eberle, and H.D. Woody, Southern Illinois University, Carbondale.
11:15 AM	2	LAND IN THE CRP: THE PREVIOUS USE OF CONTRACTED ACRES. K. Wilkins, J.D. Esseks and S.E. Kraft, Southern Illinois University, Carbondale and Northern Illinois University, DeKalb.
11:30 AM		BUSINESS MEETING

BOTANY DIVISION

DIVISION CHAIR:
Bohdan Dziadyk
Department of Biology
Augustana College
Rock Island ,IL 61201

ROOM: 405

SESSION I - Friday, October 26

PRESIDING: Bohdan Dziadyk

TIME	PAPER #	
9:00 AM	3	INFLUENCE OF SLOPE AND ASPECT ON VEGETATIONAL PATTERNS IN A CENTRAL ILLINOIS FOREST. R.L. Thomas and R.C. Anderson, Illinois State University, Normal.
9:15 AM	4	TISSUE CULTURE OF 25 YEAR-OLD CERCIS CANADENSIS L. Len Burkhart and Martin Meyer, Jr., University of Illinois, Urbana.

9:30 AM	5	ILLINOIS SPECIES OF THE MUSHROOM GENUS LACTARIUS. A.S. Methven, Eastern Illinois University, Charleston.
9:45 AM	6	EFFECTS OF SOIL SURFACE AND LITTER COVER ON GERMINATION, GROWTH, AND SURVIVAL OF CICHORIUM INTYBUS. Janice Capelle and Marian Smith, Southern Illinois University Edwardsville.
10:00 AM	7	APPLICATIONS OF POPULATION GROWTH EQUATIONS TO ALGAL TOXICOLOGY. E.P. Kreml P.K. Suresh, R.B. Brugam and F.B. Kulfinski, Southern Illinois University, Edwardsville.
10:15 AM		BREAK
10:45 AM	8	PRODUCTION ECOLOGY OF PLANT COMMUNITIES AT NACHUSA GRASSLANDS. Bohdan Dziadyk, Augustana College, Rock Island and Melanie Harding, Albion College, Albion, MI.
11:00 AM	9	EXAMINATION OF THE ALLELOPATHIC PROPERTIES OF GARLIC MUSTARD (ALLIARIA PETIOLATA). T. Kelley and R.C. Anderson, Illinois State University, Normal.
11:15 AM	10	FLORAL BIOLOGY AND BREEDING SYSTEM OF GARLIC MUSTARD (ALLIARIA PETIOLATA). F. Babonjo, S.S. Dhillion and R.C. Anderson, Illinois State University, Normal.
11:30 AM	11	BOTRYOSPORIUM LONGIBRACHIATUM (DEUTEROMYCETES, MONILIACEAE)-A PARASITE NOT PREVIOUSLY KNOWN ON TRADESCANTIA LEAVES. T.L. Ettinger, W. Lee, W.J. Sundberg and A. Pappelis, Southern Illinois University, Carbondale.
11:45 AM	12	TRILLIUM GRANDIFLORUM STEM HEIGHT AS AN INDEX OF DEER BROWSING. R.C. Anderson, Illinois State University. Normal.

SESSION II - Saturday, October 27 ROOM: 405

TIME	PAPER #	PRESIDING: Bohdan Dziadyk
9:00 AM	13	MANAGEMENT OF THE DECURRENT FALSE ASTER (BOLTONIA DECURRENS), A FEDERALLY THREATENED SPECIES, ON CORPS OF ENGINEERS' LANDS. T.M. Keevin, U.S. Army Corp of Engineers, St. Louis, MO. and M. Smith, Southern Illinois University, Edwardsville
9:15 AM	14	SEED PRODUCTION AND GERMINATION IN BOLTONIA DECURRENS (FALSE ASTER), A FEDERALLY THREATENED SPECIES. E. Melton, T. Depp, E. Geringer, M. Lankford, M. Stoecker and M. Smith, Southern Illinois University, Edwardsville, and T. Keevin, U.S. Army Corp of Engineers, St. Louis, MO.
9:30 AM	15	FLOOD TOLERANCE IN BOLTONIA DECURRENS (FALSE ASTER), A FEDERALLY THREATENED SPECIES. M. Stoecker, E. Melton, M. Smith Southern Illinois University, Edwardsville and T. Keevin, U.S. Army Corp of Engineers St. Louis, MO.
9:45 AM	16	EFFECT OF DIFFERENT GROWTH LIGHT-LEVELS ON BIOMASS, CHLOROPHYLL AND PHOTOSYNTHESIS IN BOLTONIA DECURRENS (FALSE ASTER), A FEDERALLY THREATENED SPECIES. M. Smith, Yajun Wu, L. Green, Southern Illinois University, Edwardsville, and T. Keevin, U.S. Army Corp of Engineers, St. Louis, MO.
10:00 AM		BREAK
10:30 AM	17	MITOTIC RHYTHMS IN THE LEAFY LIVERWORT LOPHOCOLEA HETEROPHYLLA (DUM.) SCHRAD. B.J. Crandall-Stotler and D.A. Cook, Southern Illinois University, Carbondale and Beebe High School, Beebe, AR.
10:45 AM	18	ASPECTS OF THE MYCORRHIZAL ECOLOGY OF LITTLE BLUSTEM (SCHIZACHYRIUM SCOPARIUM). S.S. Dhillion and R.C. Anderson, Illinois State University, Normal.

11:00 AM	19	ENVIRONMENTAL FACTORS AND NUTRITIONAL REQUIREMENTS ON SPORE GERMINATION AND GERM TUBE GROWTH OF VOLVARIELLA DIPLASIA. M. Banerjee, University of Calcutta, India and P. Banerjee, Southern Illinois University, Carbondale.
11:15 AM	20	A WOODY VEGETATION SURVEY OF TWO SLOPES AND A BOTTOMLAND AREA OF FOREST PARK SOUTH NATURE PRESERVE, PEORIA, ILLINOIS. S.J. Xavier, B.A. Frase, and H.L. Monoson, Bradley University, Peoria.

CELL, MOLECULAR AND DEVELOPMENTAL BIOLOGY

DIVISIOIN CHAIR:
Howard E. Buhse, Jr.
Department of Biological Sciences
University of Illinois
Chicago, IL 60680

ROOM: 402

SESSION I - Friday, October 26

PRESIDING: Howard Buhse

TIME	PAPER #	
1:30 PM	21	EFFECTS OF RETINOIC ACID ON AXOLOTL RIBOSOMAL RNA GENE EXPRESSION DURING LIMB REGENERATION. Y.L. Cho, J.A. Kaput and W.L. Daniel, University of Illinois, Urbana.
1:45 PM	22	ISOLATION OF PUTATIVE SPASMIN PROTEIN(S) FROM THE STALKS OF MASS CULTURED VORTICELLA. E. Vacchiano and H.E. Buhse, Jr., University of Illinois, Chicago.
2:00 PM	23	ANALYSIS OF EMBRYONIC AND ADULT ARGININE KINASE IN DROSOPHILA. J.M. James, Eastern Illinois University, Charleston.
2:15 PM	24	THE REPRODUCTIVE SYSTEM OF NEPHANES TITAN NEWTON (COLEOPTERA: PTILIIDAE). L.K. Dybas and M.A. Gatan, Knox College, Galesburg.
2:30 PM	25	METHODOLOGICAL VARIABLES IN SOME COMMON MEASUREMENTS OF IMMUNE STATUS. J.A. Wass, D.H. Steinert and P.J. Turk, American International Hospital, Zion.

CHEMISTRY/COLLEGIATE CHEMISTRY DIVISION

DIVISION CHAIR:
Timothy D. Lash
Department of Chemistry
Illinois State University
Normal, IL 61761

DIVISION CHAIR:
Kurt W. Field
Department of Chemistry
Bradley University
Peoria, IL 61625

SESSION I - Friday. October 26

ROOM: Music Room

PRESIDING: Timothy Lash

TIME	PAPER #	
9:00 AM	26	ELECTRON-NUCLEAR INTERACTIONS IN ISOTOPE EXCHANGE EQUILIBRIA. S.J. Peters and G.R. Stevenson, Illinois State University, Normal.
9:15 AM	27	[8] ANNULENE PROTONATION OR DIMERIZATION TO FORM [16] ANNULENE. R.D. Burton, S.J. Peters and G.R. Stevenson, Illinois State University, Normal.
9:30 AM	28	A DSC STUDY OF THE PHASE TRANSITIONS IN HEXADECYLAMMONIUM TETRACHLOROCADMATE (II). J.E. House, Jr. and J.A. Burroughs, Illinois State University, Normal.
9:45 AM	29	A STUDY OF THE PHASE TRANSITION IN ANHYDROUS SODIUM ACETATE. K.A. Kemper and J.E. House, Jr., Illinois State University Normal.
10:00 AM	30	MATRIX ISOLATION PHOTOLYSIS OF METALLOPORPHYRIN COMPLEXES. J.F. Bautista R.A. Watson and K.S. Suslick, University of Illinois, Urbana.
10:15 AM	31	SYNTHESIS OF PYRROLES FROM N-TOSYLGLYCINE ESTERS. M.C. Hoehner and T.D. Lash, Illinois State University, Normal.
10:30 AM	32	SYNTHESIS OF B-CYCLOPENTENOPYRROLES. D.M. Quizon and T.D. Lash, Illinois State University, Normal.
10:45 AM	33	ALKYL PHENYLHYDRAZINES AS DERIVATIZING AGENTS FOR OLIGOSACCHARIDES. M. DeCroix, E.M. Allen, T.D. Lash, M.A. Jones and J.W. Webb, Illinois State University, Normal.

11:00 AM	34	ALKYL ESTERS OF p-AMINOBENZOIC ACID AS DERIVATIZING AGENTS FOR OLIGOSACCHARIDES. V.L. Solanki, K. Fogarty, M.A. Jones and J.W. Webb., Illinois State University, Normal.
11:15 AM	35	ZERO-POINT ENERGY EXPLANATION OF ISOTOPE EFFECTS UPON ELECTRON AFFINITY. C.M. Sebenik and G.R. Stevenson, Illinois State University, Normal.
11:30 AM	36	SEPARATION OF ISOTOPOMERS. J.T. Ciszewski and G.R. Stevenson, Illinois State University, Normal.
11:45 AM		BUSINESS MEETING

SESSION II - Friday, October 26 ROOM: Music Room

TIME	PAPER #	PRESIDING: Timothy Lash
1:30 PM	37	THE EFFECT OF AROMATIC SOLVENTS ON THE REACTION OF CARBOETHOXYCARBENE WITH HYDROCARBON SOLUTES. C.A. Dvorak, A. Youngman and J.P. DeLuca, Illinois State University, Normal.
1:45 PM	38	SYNTHESIS OF B-NITROVINYL COMPOUNDS FROM METHYLARENES. H.A. Smith, Jr., Millikin University, Decatur and E. Campaigne, Indiana University, Bloomington, IN.
2:00 PM	39	EFFECTS OF SOLVENT DEUTERATION UPON ANION CHEMISTRY. M.K. Ballard and G.R. Stevenson, Illinois State University, Normal.
2:15 PM	40	THE ENRICHMENT OF RADIOACTIVE SODIUM. T.D. Halvorsen, J.T. Ciszewski, K. Reidy and G.R. Stevenson, Illinois State University, Normal.
2:30 PM	41	MECHANISM OF DEHYDRATION OF AQUAPENTAMMINECOBALT (III) COMPLEXES. D.G. Beck and J.E. House, Jr., Illinois State University, Normal.

2:45 PM	42	DETERMINATION OF FLIP-FLOP KINETICS OF STEARIC ACID NITROXIDES BY PHOTOREDUCTION. P. Yuann and P.D. Morse,II, Illinois State University, Normal.
3:00 PM	43	CHANGES IN MEMBRANE FLUIDITY INDUCED BY THE CRYOPROTECTANT TREHALOSE. K. Haskell, M.A. Jones, S.K. Webel and P.D. Morse,II, Illinois State University, Normal.

SESSION III - Friday, October 26 ROOM: Music Room

TIME PAPER # PRESIDING: Kurt Field

3:30 PM	44	MICROWAVE ESTERIFICATIONS. B.S. Hughes, J. Chai, A.D. Glover, K.W. Field and K.E. Kolb, Bradley University, Peoria.
3:45 PM	45	A NEW METHOD FOR DETERMINING CARBOXYLIC ACID CONTENT IN STARCH. C. Dolly, M. Weinstein and P. Method, A. E. Staley Co., Decatur and R. Beckwith and E. Acheson, Millikin University, Decatur.
4:00 PM	46	THE SYNTHESIS OF METHOXYBENZENES. S.M. Adamski and K.W. Field, Bradley University, Peoria, and G.B. Schuster, University of Illinois, Urbana.
4:15 PM	47	METAL COMPLEXES OF TETRAAZACYCLES WITH COORDINATING PENDANT ARMS. S.A. Frank and D.X. West, Illinois State University, Normal.
4:30 PM	48	DEGREE OF ISOMERIZATION IN FRIEDEL-CRAFTS ALKYLATIONS. B.S. Hughes, M.T. Cygan, K.W. Field and K.E. Kolb, Bradley University, Peoria.
4:45 PM	49	METAL COMPLEXES OF LARGE POLYDENTATE LIGANDS AND THEIR BIOLOGICAL ACTIVITY. A.C. Whyte, D.X. West and A.E. Liberta, Illinois State University, Normal.
5:00 PM	50	THE DEAMINATION OF ALIPHATIC AMINES. K.W. Field and D. Bettebenner, Bradley University, Peoria and E.H. White, The John Hopkins University, Baltimore, MD.

5:15 PM BAXTER HEALTHCARE AWARD. For the Best Undergraduate Research Presentation in Chemistry.

COMPUTER SCIENCE DIVISION

DIVISION CHAIR:
Charles E. Neblock
Department of Computer Science
Western Illinois University
Macomb, IL 61455

ROOM: 405

SESSION I - Friday, October 26

PRESIDING:Charles Neblock

TIME	PAPER #	
1:30 PM	51	REGIONS OF CONVERGENCE, COMPUTER GRAPHICS, AND OCTANTS. P.J.C. Lamont, Western Illinois University, Macomb.
1:45 PM	52	OCTANTS AND CRYPTOGRAPHY. P.J.C. Lamont and D. Kim, Western Illinois University, Macomb.
2:05 PM	53	COMPUTER GRAPHICS PRIMITIVES FOR USE IN IDENTIFICATION OF SCANNED IMAGES OF COCCIDIA. L.H. Tichenor, Western Illinois University, Macomb and T.E. McQuistion, Millikin University, Decatur.

EARTH SCIENCE DIVISIOIN

DIVISION CHAIR:
Richard L. Leary
Department of Geology
Illinois State Museum
Springfield, IL 62706

ROOM: 405

SESSION I - Friday, October 26

PRESIDING: Richard Leary

TIME	PAPER #	
3:00 PM		INTRODUCTION

3:15 PM	54	POSSIBLE EARLY PENNSYLVANIAN ANCESTOR OF THE CYCADALES. R.L. Leary, Illinois State Museum, Springfield.
3:30 PM	55	LITHOLOGIC CHARACTER OF THE SILURIAN BEDROCK AQUIFER NEAR LEESVILLE IN NORTHEASTERN IROQUOIS COUNTY, ILLINOIS. P.C. Reed, W.J. Morse, Illinois State Geological Survey, Champaign and S.J. Cravens, Illinois State Water Survey, Champaign.

ENGINEERING AND TECHNOLOGY DIVISION

DIVISION CHAIR:
Robert B. Rutledge
School of Engineering
Department of Electrical Engineering
Southern Illinois University
Edwardsville, IL 62026

ROOM: 405

SESSION I - Friday, October 26

PRESIDING:Robert Rutledge

TIME	PAPER #	
4:00 PM	56	A TRANSLATION-INVARIANT FEATURE FOR 2-D DISCRETE IMAGES. J.S. Chen, R. Bollini and L. Youn, Southern Illinois University, Edwardsville.
4:15 PM	57	CONSIDERATIONS IN PLANNING OF SMALL POWER PRODUCING FACILITES. L. Youn, R. Bollini and J. Chen, Southern Illinois University, Edwardsville.

ENVIRONMENTAL SCIENCE DIVISION

DIVISION CHAIR:
David Shenaut
Department of Forestry
Southern Illinois University
Carbondale, IL 62901

ROOM: 401

SESSION I - Friday, October 26

PRESIDING: David Shenaut

TIME	PAPER #	
9:15 AM	58	EFFECTS OF 2,4,6-TRINITROTOLUENE (TNT) ON INITIAL ROOT GROWTH. W.L. Tucker, W.L. Banwart and J.J. Hassett, University of Illinis, Urbana.
9:30 AM	59	THE USE OF A BUBBLE CURTAIN TO REDUCE FISH MORTALITY RESULTING FROM UNDERWATER EXPLOSIONS. T.M. Keevin, G.L. Hempen, L.G. Nico, U.S. Army Corps of Engineers, St. Louis, MO. and D. Schaeffer, University of Illinois, Urbana.

MEDICAL SCIENCE DIVISION

DIVISION CHAIR:
Carol B. Lewandowski
University of Illinois
PCRPS - Rm. 310
P. O. Box 6998
Chicago, IL 60680

ROOM: 401

SESSION I - Friday, October 26 PRESIDING: Carol Lewandowski

TIME	PAPER #	
1:30 PM	60	EFFECTS OF KETO-ACIDOSIS AND HYPERGLYCEMIA ON FUNGICIDAL ACTIVITY BY CULTURED MURINE MACROPHAGES. D. Webb, R. Hughes, R. Soltys P. Soncasie and D. Kitz, Southern Illinois University, Edwardsville.
1:45 PM	61	IN VIVO SUSCEPTIBILITY OF CHEMICALLY AND GENETICALLY DIABETIC MICE TO OPPORTUNISTIC YEAST PATHOGENS. R. Soltys and D. Kitz, Southern Illinois University, Edwardsville
2:00 PM	62	2-ARYLINDENES AS FLUORESCENT ESTROGEN RECEPTOR LIGANDS. G.M. Anstead and J.A. Katzenellenbogen, University of Illinois, Urbana.
2:15 PM	63	ULTRASTRUCTURE OF THE PERITONEUM IN PERITONITIS. J.K. Lloyd, O.A. Schleide, Northern Illinois University, DeKalb, and J.W. Dobbie, Baxter R&D Europe Nivelles (Belgium).

2:30 PM	64	A HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC METHOD TO QUANTITATE SERUM AND URINE CONCENTRATIONS OF AMINOTHIADIAZOLE IN HUMAN SUBJECTS. W.L. Strond, Evanston Hospital, Evanston.
2:45 PM		BUSINESS MEETING

MICROBIOLOGY DIVISION

DIVISION CHAIR:
John J. Bozzola
Center for Electron Microscopy
Southern Illinois University
Carbondale, IL 62901 ROOM: 402

SESSION I - Friday, October 26 PRESIDING: John Bozzola

TIME	PAPER #	
4:00 PM	65	PURIFIED COMPONENTS OF THE EXTRACTS OF ZINGIBER OFFICINALE THAT INHIBIT THE MULTIPLICATION OF CYANOPHAGE LPP-I. A. Decastro and A.S. Dhaliwal, Loyola University, Chicago.
4:20 PM	66	INHIBITORY EFFECTS OF ZINGIBER OFFICINALE ON THE REPLICATION OF CYANOPHAGE LPP-I. L.Y. Lee and A.S. Dhaliwal, Loyola University, Chicago.
4:40 PM		ELECTION OF NEW CHAIRPERSON

SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION

DIVISION CHAIR:
Alan M. Voelker
Dept. of Curriculum and Instruction
Northern Illinois University
DeKalb, IL 60115 ROOM: 401

SESSION I - Friday, October 26 PRESIDING: Alan Voelker

TIME	PAPER #	
10:00 AM	67	ENHANCEMENT OF HIGH SCHOOL BIOLOGY TEACHERS THROUGH IN-SERVICE WORKSHOPS. W.J. Sundberg, Southern Illinois University, Carbondale.
10:15 AM	68	OPERATION PHYSICS: BUILDING A FOUNDATION FOR SCIENTIFIC LITERACY IN ILLINOIS. A.M. Voelker, Northern Illinois University, DeKalb.
10:30 AM	69	A STRATEGY DEVELOPMENT MODEL FOR EDUCATIONAL/TRAINING PLANNING IN DEVELOPING NATIONS. R.N. Woll, N. Woll and Co. Inc., San Jose.
10:45 AM		BUSINESS MEETING

ZOOLOGY DIVISION

DIVISION CHAIR:
Dianne Jedlicka
Department of Biological Sciences
University of Illinois
Chicago, IL 60680 ROOM: 402

SESSION I - Friday, October 26 PRESIDING: Dianne Jedlicka

TIME	PAPER #	
9:00 AM	70	CIRCULATING AND GONADAL HORMONE LEVELS IN SEXUALLY ACTIVE AND QUIESCENT MALE WOODCHUCKS (Marmota monax). A.G. Amador, Southern Illinois University, Springfield, and I. Sinha Hikim, A. Woolf, A. Bartke and L.D. Russell, Southern Illinois University, Carbondale.
9:15 AM	71	THE PHARMACOLOGIC CONTROL OF COCCIDIAN PARASITES IN GAME-FARM REARED CHUKAR PARTRIDGES IN ILLINOIS. S. Hart and T.E. McQuistion, Millikin University, Decatur.
9:30 AM	72	GENETICS OF COTTONTAIL RABBITS IN SOUTHERN ILLINOIS. D. Shoemaker and L. Seeb, Southern Illinois University, Carbondale.

9:45 AM		BREAK
10:00 AM	73	AN EVALUATION OF THE RIDGE-MAZE PATTERN ON SURFACE EPITHELIAL CELL MEMBRANES AS A SYSTEMATIC CHARACTER IN THE FAMILY PERCIDAE. T.M. Keevin and L.M. Page, Illinois Natural History Survey, Champaign
10:15 AM	74	THE INFLUENCE OF pH AND BICARBONATE CONCENTRATION ON AMMONIA AND UREA PRODUCTION IN FRESHWATER FISHES. P.D. Fabsits and C.J. Costa, Eastern Illinois University, Charleston.
10:30 AM	75	GENETIC DIFFERENTIATION AMONG POPULATIONS OF LARGEMOUTH BASS. M.A. Nedbal and D.P. Philipp, Illinois Natural History Survey, Champaign.
10:45 AM	76	THE ROLE OF CUCKOLDER MALES IN SUNFISH HYBRIDIZATION. B.R. Konkle and D.P. Philipp, Illinois Natural History Survey, Champaign.

SESSION II - Saturday, October 27 PRESIDING:Dianne Jedlicka

TIME	PAPER #	
9:00 AM	77	THE DACNINAE (COLEOPTERA: EROTYLIDAE) OF ILLINOIS, WITH NOTES ON THEIR DISTRIBUTION AND HOST PREFERENCES. M.A. Goodrich, Eastern Illinois University, Charleston.
9:15 AM	78	HABITAT PREFERENCES OF CRAYFISHES AND MUSSELS IN THREE SOUTHERN ILLINOIS STREAMS: A PRELIMINARY REPORT. J.M. Carmody and M.A. Phillippi, Southern Illinois University, Carbondale.
9:30 AM	79	LABORATORY INTERACTION BETWEEN CHRYSOMYA RUFIFACIES AND COCHLIOMYIA MACELLARIA (DIPTERA: CALLIPHORIDAE), THE POSSIBLE CONSEQUENCES ON AN INVASION. J.D. Wells, University of Illinois, Chicago.
9:45 AM	80	A COMPARISON BETWEEN LEPOMIS SPP. FISH FROM ACID AND NON-ACID LAKES, BASED ON THE TRACE METAL CONCENTRATION OF MUSCLE TISSUE. E.N. Ratcliff, Southern Illinois University, Edwardsville.

10:00 AM		BREAK
10:15 AM	81	PRELIMINARY OBSERVATIONS OF TWO XERIC ADAPTED LIZARDS, TROPIDURUS PERUVIANUS AND PHYLLODACTYLUS GERRHOPYGUS, ALONG THE SOUTHWEST COAST OF PERU. W.L. Strond, Evanston Hospital, Evanston.
10:30 AM	82	THE USE OF TAIL BAND PATTERNS / RATTLE INJECTION (WITH PLASTIC PAINT) TO IDENTIFY AND MONITOR FERAL POPULATIONS OF WESTERN DIAMONDBACK RATTLESNAKES. W.L. Strond and R. Feldman, Evanston Hospital, Evanston.
10:45 AM	83	AN EMPIRICALLY-BASED HABITAT SUITABILITY MODEL FOR GOLDEN MICE IN ILLINOIS. K.A. Furtak, G.A. Feldhamer and P.A. Robertson, Southern Illinois University, Carbondale.
11:00 AM	84	ESTIMATION OF THE DEER POPULATION OF THE SIUE CAMPUS. A. Keele, E. Ratcliff and F.B. Kulfinski, Southern Illinois University, Edwardsville.
11:15 AM		BUSINESS MEETING

POSTER SESSION

Friday, October 26
5:00 PM - 6:00 PM

Levis Center
Second Floor

POSTER #

85 SPATIAL DISTRIBUTION OF BACTERIA AND FUNGI ON THE RHIZOPLANE OF FIRST YEAR GARLIC MUSTARD (ALLIARIA PETIOLATA) PLANTS. J.A. Meredith and S.S. Dhillion, Illinois State University, Normal.

86 COMPARATIVE ULTRASTRUCTURE OF FIXED AND FREE CILIATED URNS IN SIPUNCULAN WORMS. L.K. Dybas and G.M. Melendres, Knox College, Galesburg.

87 INDUCTION OF GLUTATHIONE S-TRANSFERASE ACTIVITY IN THE HOUSEFLY, Musca domestica, USING PHENO-BARBITAL AND SODIUM BARBITAL. S.A. McCommas and E.D. Boedeker, Southern Illinois University, Edwardsville.

88 THE EFFECT OF SODIUM IODATE ON MELANIN. A. Baich and M. Ziegler, Southern Illinois University, Edwardsville.

89 NEW CHEMICALS FOR FINGERPRINTING: PYRAZINE ANALOGS OF NINHYDRIN AND DFO. F.J. Frank and B. Borup, Illinois Wesleyan University, Bloomington.

90 NEW CHEMICALS FOR FINGERPRINTING: PYRAZINE ANALOGS OF NINHYDRIN AND DFO. F.J. Frank, A.J. Carr and K.L. Hund, Illinois Wesleyan University, Bloomington.

91 EARLY HOLOCENE FOREST REMAINS DISCOVERED ON THE FLOOR OF SOUTHERN LAKE MICHIGAN. F.A. Pranschke and C.W. Shabica, Northeastern Illinois University, Chicago, and M.J. Chrzastowski, Illinois State Geological Survey, Champaign.

92 AN ENIGMATIC GLACIO-FLUVIAL DEPOSIT IN WEST-CENTRAL MERCER COUNTY, ILLINOIS. R.L. Welch and L.A. Wiedman, Monmouth College, Monmouth.

93 WETLAND RESTORATION/MITIGATION AT SAVANNA, ILLINOIS. C.S. Rodgers, Illinois Department of Transportation, Dixon, and P.A. Malone, Illinois Department of Conservation, Springfield.

94 LAND USE CHANGES IN CHAMPAIGN COUNTY OVER THE PAST 30 YEARS. D.L. Szafoni, C. Nixon and L.L. Osborne, Illinois Natural History Survey, Champaign.

95 A COMPARISON OF VENOUS OCCLUSION, STRAIN GAUGE PLETHYSMOGRAPHY TO MEASURE CALF AND FOREARM BLOOD FLOW IN RESPONSE TO ICE WATER IMMERSION. R.J. Baker, University of Illinois, Urbana.

96 PHOSPHOINOSITIDE ANALYSIS DURING THE CELL CYCLE. C. Hendrell and P. Wanda. Southern Illinois University, Edwardsville.

97 PROGRESSION OF PROTOZOAN SPECIES WITHIN AERATION BASINS OF AN ACTIVATED SLUDGE WASTEWATER TREATMENT FACILITY. J.L. Roberts and P.J. Nielsen, Western Illinois University, Macomb.

98 OSTEOLOGY OF DARTERS. R.R. Stephens, Bradley University, Peoria, and L.M. Page, Illinois Natural History Survey, Champaign.

99 SUBSPECIFIC STATUS OF REGIONAL ILLINOIS DEER HERDS. J.M. Levengood, A. Woolf and J.L. Roseberry, Cooperative Wildlife Research Laboratory, Southern Illinois University, Carbondale.

100 THE REMARKABLE LONGEVITY OF BOX TURTLES. R.E. Johnson, R. Elghammer and D. Beyer, Knox College Galesburg and University of Illinois, Urbana.

101 ILLINOIS WOODLAND RAPTOR SURVEY. P.L. Malmborg and G.C. Vanderah, Illinois Natural History Survey, Champaign.

102 THE EFFECTS OF UNFAVORABLE MEDIA IN FLOUR BEETLE POPULATIONS. S. Kotomatas, University of Illinois, Chicago.

103 DIET CHOICE AS A MECHANISM OF COEXISTENCE IN SCIURID RODENTS. D.M. Jedlicka, University of Illinois, Chicago.

104 THE SIGNIFICANCE OF FOSSILS IN SYSTEMATIC AND EVOLUTIONARY RESEARCH. T.C. Grande, University of Illinois, Chicago.

105 VALUE OF MUSSEL BEDS TO SPORT FISHERIES. P.B. Moy and R.E. Sparks. Illinois Natural History Survey, Havana.

AUTHOR INDEX

AUTHOR	ABSTRACT #
Acheson, E.	45
Adamski, S.M.	46
Allen, E.M.	33
Amador, A.G.	70
Anderson, R.C.	3,9,10,12,18
Anstead, G.M.	62
Babonjo, F.	10
Baich, A.	88
Baker, R.J.	95
Ballard, M.K.	39
Banerjee, M.	19
Banerjee, P.	19
Bantista, J.F.	30
Banwart, W.L.	58
Bartke, A.	70
Beck, D.G.	41
Beckwith, R.	45
Bettebenner, D.	50
Beyer, D.	100
Boedeker, E.D.	87
Bollini, R.	56,57
Borup, B.	89
Brugam, R.B.	7
Buhse,Jr.,H.E.	22
Burkhart, L.	4
Burroughs, J.A.	28
Burton, R.D.	27
Campaigne, E.	38
Capelle, J.	6
Carmody, J.M.	78
Carr, A.J.	90
Chai, J.	44
Chen, J.S.	56,57
Cho, Y.L.	21
Chrzastowski, M.J.	91
Ciszewski, J.T.	36,40
Cook, D.A.	17
Costa, C.J.	74
Crandell-Stotler, B.J.	17
Cravens, S.J.	55
Cygan, M.T.	48
Daniel, W.L.	21
Decastro, A.	65
DeCroix, M.	33
DeLuca, J.P.	37
Depp, T.	14
Dhaliwal, A.S.	65,66
Dhillion, S.S.	10,18,85
Dobbie, J.W.	63
Dolly, C.	45
Dvorak, C.A.	37
Dybas, L.K.	24,86
Dziadyk, B.	8
Eberle, P.R.	1
Elghammer, R.	100
Esseks, J.D.	2
Ettinger, T.L.	11
Fabsits, P.D.	74
Feldhamer, G.A.	83
Feldman, R.	82
Field, K.W.	44,46,48,50
Fogarty, K.	34
Frank, F.J.	89,90
Frank, S.A.	47
Frase, B.A.	20
Furtak, K.A.	83
Gatan, M.A.	24
Geringer, E.	14
Glover, A.D.	44
Goodrich, M.A.	77
Grande, T.C.	104
Green, L.	16
Halvorsen, T.D.	40
Harding, M.	8
Hart, S.	71
Haskell, K.	43
Hassett, J.J.	58
Hempen, G.L.	59
Hendrell, C.	96
Hikim, I.S.	70
Hoehner, M.C.	31
House, Jr., J.E.	28,29,41
Hughes, B.S.	44,48
Hughes, R.	60
Hund, K.L.	90

James, J.M. 23
Jedlicka, D.M. 103
Johnson, R.E. 100
Jones, M.A. 33,34,43

Kaput, J.A. 21
Katzenellenbogen, J.A. 62
Keele, A. 84
Keevin, T.M. 13,14,15,16,59,73
Kelley, T. 9
Kemper, K.A. 29
Kim, D. 52
Kitz, D. 60,61
Kolb, K.E. 44,48
Konkle, B.R. 76
Kotomatas, S. 102
Kraft, S.E. 2
Kreml, E.P. 7
Kulfinski, F.B. 7,84

Lamont, P.J.C. 51,52
Lankford, M. 14
Lash, T.D. 31,32,33
Leary, R.L. 54
Lee, L.Y. 66
Lee, W. 11
Levengood, T.M. 99
Liberta, A.E. 49
Lloyd, J.K. 63

Malmborg, P.L. 87
Malone, P.A. 93
McCommas, S.A. 87
McQuistion, T.E. 53,71
Melendres, G.M. 86
Melton, E. 14,15
Meredith, J.A. 85
Methevan, A.S. 5
Method, P. 45
Meyer, Jr., M. 4
Monoson, H.L. 20
Morse,II, P.D. 42,43
Morse, W.J. 55
Moy, P.B. 105

Nedbal, M.A. 75
Nico, L.G. 59
Nielsen, P.J. 97
Nixon, C. 94

Osborne, L.L. 94

Page, L.M. 73,98
Pappelis, D.P. 11
Peters, S.J. 26,27
Philipp, D.P. 75,76
Phillippi, M.A. 78
Pranschke, F.A. 91

Quizon, D.M. 32

Ratcliff, E.N. 80,84
Reed, P.C. 55
Reidy, K. 40
Roberts, J.L. 97
Robertson, P.A. 83
Rodgers, C.S. 93
Roseberry, J.L. 99
Russell, L.D. 70

Schaeffer, D. 59
Schjeide, O.A. 63
Schuster, G.B. 46
Sebenik, C.M. 35
Seeb, L. 72
Shabica, C.W. 91
Shoemaker, D. 72
Sickmeyer, K.A. 1
Smith, Jr., H.A. 38
Smith, M. 6,13,14,15,16
Solanki, V.L. 34
Soltys, R. 60
Soncasie, P. 60,61
Sparks, R.E. 105
Steinert, D.H. 25
Stephens, RR 98
Stevenson, G.R. 26,27,35,36,39,40
Stoecker, M. 14,15
Strond, W.L. 64,81,82
Sundberg, W.J. 11,67
Suresh, P.K. 7
Suslick, K.S. 30
Szafoni, D.L. 94

Thomas, R.L. 3
Tichenor, L.H. 53
Tucker, W.L. 58
Turk, P.J. 25

Vacchiano, E. 22
Vanderah, G.C. 101
Voelker, A.M. 68

Wanda, P. 96
Wass, J.A. 25
Watson, R.A. 30
Webb, D. 60
Webb, J.W. 33,34
Webel, S.K. 43
Welch, R.L. 92
Wells, J.D. 79
Weinstein, M. 45
West, D.X. 47,49
White, E.H. 50
Whyte, A.C. 49
Wiedman, L.A. 92
Wilkins, K. 2
Woll, R.N. 69
Woody, H.D. 1
Woolf, A. 70,99
Wu, Y. 16

Xavier, S.J. 20

Youn, L. 56,57
Youngman, A. 37
Yuann, P. 42

Ziegler, M. 88

ABSTRACTS

1

ESTIMATING THE RELATIONSHIP BETWEEN THE SALE PRICE OF YOUNG BEEF BULLS AND ESTIMATED PROGENY DIFFERENCES. K. A. Sickmeyer, P. R. Eberle, and H. D. Woody, Southern Illinois University-Carbondale, Carbondale, IL 62901. The objective of this study was to determine the relationship between young bull sale price and various estimated progeny differences (EPDs). Such information is useful to breeders to determine the economic value of traits to emphasize in their sire selection. Multiple regression models with sale price as the dependent variable and EPDs, EPD accuracies, breed, age, year and location of sale as explanatory variables were estimated. Data was collected from 408 bulls offered for sale at the Illinois Performance Test Sale in Springfield, Western Illinois University Performance Test Sale, and Southern Illinois University Performance Test Sale. Prelimenary results indicated that EPDs explained less than 20 percent of sale price variation.

2

LAND IN THE CRP: THE PREVIOUS USE OF CONTRACTED ACRES. K. Wilkins J.D. Esseks, and S.E. Kraft, Southern Illinois University, Carbondale, Il 62901 and Northern Illinois University, DeKalb, Il 60115. Data on actual CRP contracts are used to study the use of land placed under CRP contracts. Previous work has only looked at base acres retired under the CRP not how the land was actually used before placed in the Reserve. The information is used to look at implications for post-contract use of the land. Data are derived from counties in Illinois, Indiana, Missouri, Iowa, and Wisconsin.

3

INFLUENCE OF SLOPE AND ASPECT ON VEGETATIONAL PATTERNS IN A CENTRAL ILLINOIS FOREST. R. L. Thomas and R. C. Anderson, Illinois State University, Normal, IL 61761. The effects of slope and aspect on the distribution of vegetation were studied in 26 relatively undisturbed stands in a central Illinois forest. Detrending correspondence analysis was performed on tree species' Importance Values. Ordination scores were generated and used as dependent variables during multiple regression analyses. Slope and aspect from each stand were assigned index values based on their influence on potential soil moisture availability and were used as independent variables. Site protection rating and transformed aspect accounted for 73% of the variability in DCA Axis I scores ($R^2 = 0.73$, $p < 0.001$). Slope steepness and transformed aspect were predictors for DCA Axis III scores accounting for 25% of the variability in these scores ($R^2 = 0.25$, $p < 0.036$).

4

TISSUE CULTURE OF 25 YEAR-OLD CERCIS CANADENSIS L.

Len Burkhart and Martin Meyer, Jr., University of Illinois, Urbana, IL 61801.

Shoots from a 25 year-old redbud were collected during July 1989, disinfested with 0.1% w/v mercuric chloride and established in vitro on modified MS medium. Shoots proliferated poorly with lower concentrations of Benzyladenine (BA) and high concentrations of BA caused shoot tip abortion. Similar problems with red-silver hybrid maples were solved by the use of Thidiazuron (TZ) in the medium. Redbud shoots, 2 cm, from established cultures were treated with TZ (0, 0.05, and 0.1 uM) and BA (0, 1 and 5 uM) in a factorial arrangement to test for shoot proliferation. After 6 weeks, mean shoot number was 7.1 for the treatment with 0.1 uM TZ and 5 uM BA, compared to 2.6 shoots containing 5 uM BA in the medium. Further experiments with rooting treatments will be presented.

5

ILLINOIS SPECIES OF THE MUSHROOM GENUS LACTARIUS. A. S. Methven, Eastern Illinois University, Charleston, IL 61920. The genus Lactarius is one of the more conspicuous, abundant, and recognizable genera of ectomycorrhizal basidiomycetes in North America. Although a monograph of Lactarius in North America has been published, a substantial amount of work remains to be completed, particularly in geographical localities where the genus has not been adequately sampled. The Midwest, specifically Illinois, is illustrative of a region whose endemic mycota is poorly known. Portions of east-central and southern Illinois represent areas where the northern hardwood forests of the Great Lakes region collides with a vascular plant flora endemic to the southeastern United States and coastal plain. The transitional zone between these distinctive vascular plant floras is reflected in a unique assemblage of ectomycorrhizal basidiomycetes. In order to elucidate one of these assemblages, a systematic study of Lactarius was initiated in Illinois. In the past two years twelve taxa not previously known from Illinois were collected in the east-central and southern portions of the state, doubling the number of taxa previously known from this geographical region. Photographs and distributional maps of selected taxa will be presented along with data on putative ectomycorrhizal associates.

6

EFFECTS OF SOIL SURFACE AND LITTER COVER ON GERMINATION, GROWTH, AND SURVIVAL OF CICHORIUM INTYBUS. Janice Capelle and Marian Smith, Southern Illinois University at Edwardsville, IL. 62026-1651. Cichorium intybus is a perennial species which commonly occurs in dry, rocky soil in parking lots and along roadsides. As part of a comprehensive study of the ecophysioloy of C. intybus, a greenhouse experiment was conducted to determine the effects of soil surface on germination and seedling establishment. Seeds were sprinkled onto different soil surfaces (smooth, soil clods, rocks, and litter) and germination rate, seedling survival and growth were monitored. Results indicated that soil clods and rocks provided the most favorable environment for germination and growth, and may be important habitat conditions which affect the natural distribution of C. intybus.

7

Applications of Population Growth Equations to Algal Toxicology. E.P. Kreml, P.K. Suresh, R.B. Brugam, and F.B. Kulfinski, Southern Illinois University at Edwardsville, Edwardsville, IL 62026. Selenastrum capricornutum and Scenedesmus quadricauda were each grown in modified Weber's Medium in Nephelo flasks. Their population growth was measured in relation to toxic copper concentrations using a colorimeter set at a pre-determined peak absorbance wavelength. Verhulst-Pearl equations were applied to the population growth data and r and K values were calculated for each concentration of toxicant. Except for very low concentrations of copper, which were stimulatory, increasing copper concentrations yielded diminishing r and K values. The use of r and K values in determining the degree of toxicity is discussed.

8

PRODUCTION ECOLOGY OF PLANT COMMUNITIES AT NACHUSA GRASSLANDS. Bohdan Dziadyk, Augustana College, Rock Island, Il, 61201-2296, and Melanie Harding, Albion College, Albion, MI, 49224.
In 1986 The Nature Conservancy established the Nachusa Grasslands preserve in southern Ogle and northern Lee counties in Illinois. This 285 ha preserve is a mosaic of cropped land, old fields, wetlands, savannas and native prairies. TNC long-term management goals specify extensive restoration of native plant communities. In spring 1990 we began a long-term ecological research project to determine baseline floristic and biomass data and to monitor future changes in four plant communities. The harvest method was used to sample aboveground biomass components twice monthly during the growing season. Plant communities and peak live biomass (g/m^2 through early August) were 1. little bluestem pasture (578), 2. weedy old field (371), 3. wet sedge meadow (696) and 4. dry gravel prairie (441). These biomass values may be greater than the long-term means due to unusually high precipitation early in the current growing season which may have enhanced plant growth.

9

EXAMINATION OF THE ALLELOPATHIC PROPERTIES OF GARLIC MUSTARD (ALLIARIA PETIOLATA). T. Kelley and R. C. Anderson. Illinois State University, Normal, IL 61761.
Garlic mustard is an exotic plant species which is aggressively invading woodlands especially in northern and central Illinois. This suggests that it may have allelopathic properties. A water extract of garlic mustard was found to inhibit seedling development of several garden annuals (wheat, radish, tomato, and lettuce). Thin layer chromatography (TLC) was used to separate the water soluble constituents and the upper portion of the chromatograph was found to contain the active inhibitor. The use of millipore filtered and unfiltered extracts in a bioassay suggests that microbial products are not involved in the observed inhibitor properties of the extract.

10

FLORAL BIOLOGY AND BREEDING SYSTEM OF GARLIC MUSTARD (ALLIARIA PETIOLATA).
F. Babonjo, S. S. Dhillion, and R. C. Anderson, Illinois State University, Normal, IL 61761.
The floral features of garlic mustard are typical of the mustard family, Brassicaceae. To study the phenology of the flower, four conspicuous phenological stages were recognized: (1) 2 mm bud; (2) 3 mm bud; (3) calyx cap; and (3) anthesis stages. The young bud (2 mm length) is entirely green and enlarges in about one day into the 3 mm bud stage with alternating green and white stripes on the calyx. As the petals began to elongate, the calyx becomes detached from the receptacle. However, the free sepals overlap (imbricate) and form a calyx cap covering the upper 1/3 of the flower, which encloses the four petals and stamens. During the calyx cap stage the anthers began to dehisce and by anthesis the stigma is laden with pollen. The stigma is receptive in all the phenological stages observed. In contrast, the pollen grains have the highest germination in the calyx cap stage. The pollen to ovule ratio is low, 210:1. Breeding system studies revealed that the plant is autogamous, although artificial cross pollination results in fruit and seed set.

11

BOTRYOSPORIUM LONGIBRACHIATUM (DEUTEROMYCETES, MONILIACEAE)--A PARASITE NOT PREVIOUSLY KNOWN ON TRADESCANTIA LEAVES. T. L. Ettinger, W. Lee, W. J. Sundberg, and A. Pappelis, Department of Plant Biology, Southern Illinois University, Carbondale, IL 62901. Leaves on Tradescantia sp. (clones 02 and 4430) being used for radiation and pollution studies and held in a growth chamber became infected with Botryosporium longibrachiatum (Ouedem.) Maire. To our knowledge, this represents a new host for this facultative parasitic fungus. In diseased leaves, infection occurs most frequently at or near the leaf tip, rapidly spreads down the leaf, and necrosis results. Conidiophores and conidia are abundant on older diseased tissue. Pure cultures can readily be established from conidia. Attempts to initiate infection in exposed leaves and leaf parts enclosed in home-made humidity chambers on plants growing on laboratory benchtops failed. Development of diseased leaves on plants in the growth chamber and observation in a greenhouse of infections on parts of leaves near pot water catch trays and moist bench rock suggests that humidity may be important in spore germination or the infection process or both. More detailed studies are now underway to determine requirments for infection and symptom development . The original source of inoculum is unknown. But, since it occurs on plant debris and was previously isolated from the Department greenhouse, B. longibrachiatum may be more common than frequency of reports indicates.

12

TRILLIUM GRANDIFLORUM STEM HEIGHT AS AN INDEX OF DEER BROWSING.
R. C. Anderson. Illinois State University, Normal, IL 61761.
Because of the rapid and potentially devastating impact of deer browsing on natural vegetation, there is a need to develop easily employed methods to assess browsing intensity. Trillium stem height can be used as an indicator of deer browsing intensity. Deer forage selectively on trillium consuming larger flowering plants more readily than non-flowering plants. In a 2-year old deer exclosure, (Lake County, IL) non-flowering plants had significantly ($P<0.001$) shorter stems than flowering plants (14.2 ± 6.2cm vs. 22.7 ± 3.4cm, mean $\pm$ SD). Plants in adjacent unprotected areas had significantly smaller stems (8.2 ± 3.2cm) than either group of plants in the exclosure. Stem height had positive linear correlations with density of reproductive units (flowers or fruits) of perennial plants ($r = 0.928$, $0.10>P>0.05$) and with unbrowsed plants ($r = 0.956$, $P<0.05$).

13

MANAGEMENT OF THE DECURRENT FALSE ASTER (BOLTONIA DECURRENS), A FEDERALLY THREATENED SPECIES, ON CORPS OF ENGINEERS' LANDS. T. M. Keevin and *M. Smith. U.S. Army Corps of Engineers, St. Louis, MO. 63101-1986 and *Southern Illinois University, Edwardsville, IL. 62026-1651. A population of Boltonia decurrens was discovered growing in a borrow pit used for construction of the access road leading to the construction site for Melvin Price Locks and Dam. The 40 acre borrow pit, currently being developed as a fishing lake, filled with water after the pool was raised for the new lock and dam, destroying the population. As mitigation for the loss of the borrow pit population, plants were transplanted to an unaffected area on Corps of Engineers' land. The transplanted decurrent false aster population is currently being monitored and managed by District biologists. A life history study has been initiated to obtain information to better manage the species on Corps' lands. The monitoring program, management plan and life history study will be discussed.

14

SEED PRODUCTION AND GERMINATION IN BOLTONIA DECURRENS (FALSE ASTER), A FEDERALLY THREATENED SPECIES. E. Melton, T. Depp, E. Geringer, *T. Keevin, M. Lankford, M. Stoecker and M. Smith, Southern Illinois University, Edwardsville, Il. 62026-1651 and *U.S. Army Corps of Engineers, St. Louis, Mo. 63101-1986. In a study designed to elucidate basic biological and life history patterns in Boltonia decurrens, seed production was determined for plants from a natural population in St. Charles Co., Mo. It was determined that plant height, dry weight, and above- and below-ground biomass were closely correlated with plant fecundity. In addition, light, seed size, and seed type had a significant effect on germination.

15

FLOOD TOLERANCE IN BOLTONIA DECURRENS (FALSE ASTER), A FEDERALLY THREATENED SPECIES. M. Stoecker, E. Melton, M. Smith and *T. Keevin, Southern Illinois University, Edwardsville, Il. 62026 and *U.S. Army Corps of Engineers, St. Louis, Mo. 63101. The declining number of populations of B. decurrens, which inhabits lake shores and river banks, is thought to be related to heavy siltation and modified flood patterns, as well as the draining and cultivation of wetlands. Roles of prolonged inundation, deposition of silt, and seed dispersal by flotation were investigated in laboratory experiments. Established plants were extremely flood tolerant -- surviving and growing in standing water for 30 days. Seeds appear to be morphologically adapted for dispersal on river or lake currents, and germinated upon removal from water; however, seeds covered with silt remained dormant.

16

EFFECT OF DIFFERENT GROWTH LIGHT-LEVELS ON BIOMASS, CHLOROPHYLL AND PHOTOSYNTHESIS IN BOLTONIA DECURRENS (FALSE ASTER), A FEDERALLY THREATENED SPECIES. M. Smith, Yajun Wu, L. Green and *T. Keevin, Southern Illinois University, Edwardsville, Il., 62026-1651 and *U.S. Corps of Engineers, St. Louis, Mo. 63101-1986. In dense weedy areas B. decurrens does not reproduce sexually, and vegetative regeneration ceases after 4 or 5 years, even in areas otherwise suitable for population expansion. The role of light in this limitation was studied in a lab experiment by measuring biomass, chlorophyll production and photosynthetic rates on plants grown at three light levels -- 10%, 25% and 100% full sun. All measurements indicated that B. decurrens requires high light for optimal growth and photosynthesis, and would be unlikely to persist in a community where other plants overtopped it and reduced growth light levels.

17

MITOTIC RHYTHMS IN THE LEAFY LIVERWORT *LOPHOCOLEA HETEROPHYLLA* (DUM.) SCHRAD. B. J. Crandall-Stotler and D. A. Cook, Southern Illinois University, Carbondale, IL 62901 and Beebe High School, Beebe, AR 72012. It has been repeatedly demonstrated that certain angiosperms display diurnal peaks in mitotic activity in their root and/or shoot meristems. Whether such rhythms also characterize meristems generated from centralized apical cells, such as those of the bryophytes, was tested in the liverwort *Lophocolea heterophylla*. Mitotic indices, determined from paraffin-sectioned samples, fixed at 2 hr intervals through a 24 hr cycle, verify that there is a maximal index of 0.33 at 2:00 and a substantially lower minimal index of 0.06, 12 hrs later at 14:00. These rhythmic maxima and minimal values, which are consistent with indices recorded in *Allium* root tips, suggest that mitotic rhythms are a universal feature of plant meristems.

18

ASPECTS OF THE MYCORRHIZAL ECOLOGY OF LITTLE BLUSTEM (SCHIZACHYRIUM SCOPARIUM). S. S. DHILLION and R. C. ANDERSON. Department of Biological Sciences, Illinois State University, Normal, IL 61761.
This study examined the influence of burning on the productivity, tissue inorganic nutrient concentration and vesicular-arbuscular mycorrhizae (VAM) fungus association of little bluestem. Burning significantly affected VAM fungus colonization and colonized root length, plant production and tissue inorganic nutrient concentration. Productivity was found to be significantly higher on the burned site than on the unburned during the growing season. For samples taken from May through October, percent VAM fungal colonization levels were significantly lower on the burned site than on the unburned site. In contrast, colonized root lengths were longer on the burned site than on the unburned site but differences between sites were not always statistically significant. Above- and belowground tissue samples showed significantly higher levels of several inorganic nutrients on the burned site than the unburned site in early May and late June samples. This was true when nutrients were expressed as concentrations (% and ppm) in tissue and nutrients in tissue per m^2 (mg and g/m^2).

19

ENVIRONMENTAL FACTORS AND NUTRITIONAL REQUIREMENTS ON SPORE GERMINATION AND GERM TUBE GROWTH OF VOLVARIELLA DIPLASIA. M. Banerjee, Mushroom Research Center, Dept. of Botany, University of Calcutta, 35 Ballygunje Circular Road, Calcutta 700019, India (Present address: 177-5 Evergreen Terrace, Carbondale, IL 62901) and P. Banerjee, Dept. of Plant Biology, Southern Illinois University, Carbondale, IL 62901. The effect of some environmental factors and exogenous nutritive sources on spore germination and germ tube growth of Volvariella diplasia (Berk & Br.) Sing. was investigated. Spore germination was high. A somewhat weak acidic environment (pH 5.5) with a temperature of 40 C proved the best for spore germination. Among the exogenous sources tested, starch was the best carbon source for both the germination and germ tube growth, and among the nitrogen sources, peptone and ammonium sulphate gave the best results. A high ratio of exogenous nitrogen in the medium proved favorable.

20

A WOODY VEGETATION SURVEY OF TWO SLOPES AND A BOTTOMLAND AREA OF FOREST PARK SOUTH NATURE PRESERVE, PEORIA, ILLINOIS. S. J. Xavier, B. A. Frase, and H. L. Monoson, Bradley University, Peoria, IL 61625.

A total of twenty-four woody angiosperm species belonging to thirteen families were identified from three sites located in Forest Park South Nature Preserve. Measures of importance value (IV), species diversity, and coefficient of community were determined for the three sites. The families best represented in the study were Fabaceae and Juglandaceae. Acer saccharum Marsh. had the highest IV on all three sites. The largest number of trees, saplings, and seedlings were found on the northeast-facing slope. Diversity was highest on this same slope for trees, saplings, and seedlings below 0.45m. Reproductive amounts noted in the three areas suggest that A. saccharum will continue to be the most dominant species and that the various species of Quercus will be eliminated eventually from the three areas.

21

EFFECTS OF RETINOIC ACID ON AXOLOTL RIBOSOMAL RNA GENE EXPRESSION DURING LIMB REGENERATION. Y.L. Cho, J.A. Kaput and W.L. Daniel, University of Illinois, Urbana, IL 61801. cDNA probes for Xenopus nuclear rRNA and axolotl mitochondrial rRNA genes were prepared and used to study the effects of retinoic acid upon rRNA gene expression during limb regeneration. Amplification of rRNA genes and their transcripts were studied by Southern and Northern blotting during the initial dedifferentiation (ID), medium bud (MB), notch (N), and 3-finger bud (3FB) stages. Amplification of nuclear rDNA occurred during the N and 3FB stages in control blastemas. Retinoic acid altered the temporal pattern of amplification and magnified the amplification of nuclear rDNA. Control blastemas possessed a smaller nuclear rDNA fragment during the MB stage. This fragment was less prominent in retinoic acid-treated blastemas. Retinoic acid did not appear to significantly affect mitochondrial rDNA levels. Northern blots revealed a moderate increase in cytosolic rRNA during the ID, MB, and N stages of retinoic acid-treated blastemas compared to those of controls. Mitochondrial rRNA levels were comparable in control and retinoic acid-treated blastemas at all four stages. These trends suggest that retinoic acid predominantly affects nuclear rRNA gene expression by increasing both the level of rRNA and the copy number of rRNA genes.

22

ISOLATION OF PUTATIVE SPASMIN PROTEIN(S) FROM THE STALKS OF MASS CULTURED *VORTICELLA*. E. Vacchiano and H. E. Buhse Jr., University of Illinois at Chicago, Chicago, IL 60680. *Vorticella* grown on Cerophyl (1.5 g/L) (Vacchiano & Buhse, 1989, Trans. Am. Micros. Soc. *109:* 112) were harvested and purified by taking advantage of an induced attachment and detachment method which resulted in production of 1100 unattached *Vorticella* per ml (Buhse & Vacchiano, 1990 Conference on Biochemistry, Cell Biology, and Protists, Luray, VA). The stalks of *Vorticella* were separated from the cell bodies (zooids) by the following method: Intact *Vorticella* (250,000 cells) were extracted in 0.1% saponin for 45 min followed by exposure to cold glycerol for 2 hr to several weeks (Asai *et al.*, 1978, J. Biochem. *83:* 775-788). Next the cells were subjected to up and down pipetting, which sheared the stalks away from the zooids in the region of the scopular basal bodies (Routledge, 1978, J. Cell. Biol. *77:* 358-370). Stalks and zooids were then layered on a discontinuous glycerol gradient (50% and 75%) in a 50 ml centrifuge tube and spun at 600 g for 1 hr. The majority of the stalks became concentrated in 50% glycerol while most of the zooids were found in the 75% glycerol fraction. When the stalk preparation concentrated by high speed centrifugation was recentrifuged over glycerol gradient at low speed using the same procedure described above, purified stalks were obtained. When the stalk proteins were solubilized in SDS and subjected to polyacrylamide gel electrophoresis, four Coomassie blue staining bands of molecular weights around 16, 18, 20, and 22 kd were observed. We tentatively conclude that these proteins are spasmins based on the fact that they are enriched greatly in our purified stalk preparations and the fact that proteins of similar molecular weight have been identified as spasmin proteins from the stalks of a variety of Peritrichs including *Vorticella* (Ochiai *et al.*, 1988, Experientia *44:* 768-771).

23

ANALYSIS OF EMBRYONIC AND ADULT ARGININE KINASE IN DROSOPHILA. J. M. James, Eastern Illinois University, Charleston, IL 61920. Arginine kinase (AK) is an enzyme that replenishes energy supplies necessary for cell motility, muscle contraction, and other activities. In the insect Drosophila melanogaster, AK is encoded by a gene whose expression is developmentally regulated. AK levels fluctuate in a predictable pattern through the embryonic, larval, pupal and adult stages, but until recently it was thought that the same form of AK was present in each stage. However, AK of the early embryo is unique, and presumably is put into the egg during its development within the maternal ovary. Embryos begin to produce AK encoded by their own genes about 12 hours after fertilization. Embryonic and adult AK have differing electrophoretic mobility and charge. Comparison with other tissues suggests a specific role for embryonic AK in supplying energy for rapid cell division occurring at this stage.

24

THE REPRODUCTIVE SYSTEM OF NEPHANES TITAN NEWTON (COLEOPTERA: PTILIIDAE). L. K. Dybas and M. A. Gatan. Knox College, Galesburg, IL 61401. The family ptiliidae, commonly known as featherwing beetles, are the smallest known beetles. The N. titan used in this study are 0.8mm long and were collected by Berlese technique from stable sweepings. The spermatheca, or sperm storage organ, shows extraordinary variability in the family though in any one species it is remarkably constant in form. Sperm too exhibit variation. There tends to be a close correlation between sperm and spermatheca. In most species sperm are transferred directly to the female. N. titan is unique among ptiliids in the fact that the sperm are transferred to the female enclosed in a sac, the spermatophore. In this study the development of sperm is followed by light and electron microscopy to their enclosure within spermatophores. N. titan spermatophores are very large and have a distinctive shape which conforms to the diameter and curvature of the female spermatheca. About 5-10 can be found in most male abdomens. In the female they can be seen lined up on a kind of internal monorail inside the spermatheca. The ultrastructure of the spiral-shaped spermatheca with its muscular pump-like apparatus is also described.

25

METHODOLOGICAL VARIABLES IN SOME COMMON MEASUREMENTS OF IMMUNE STATUS

J. A. Wass, D. H. Steinert and P. J. Turk. American International Hospital, Zion, Illinois 60099.

High degrees of variability among normal populations as well as inter-laboratory differences in technique have severely limited the usefullness of immunologic screening in cancer patients. In tests such as T-Cell Suppression, Mitogen Stimulation, and Natural Killer Cell function, we have found that assay results are strongly dependent upon type of and percentage of serum supplementation, concentration of critical ions such as CA^{++} and Mg^{++} and radioisotope ratios. Preparation and counting of cells is also strongly methodologically dependent, with pronounced differences based upon sample age and manual versus automatic counting. Various functional responses evidence differential time degradation which further complicates a coherent immunologic profile. In this environment it is critical that assays be standardized and quantitative criteria for maximal response be established for individual patients and controls.

26

ELECTRON-NUCLEAR INTERACTIONS IN ISOTOPE EXCHANGE EQUILIBRIA. Steven J. Peters and Gerald R. Stevenson, Illinois State University, Normal, IL 61761.

A very large equilibrium isotope effect (confirmed via physical separation of the isotopes involved) was observed via the EPR analysis of a mixture of benzene and perdeuteriated-per-^{13}C-benzene competing for a deficient number of electrons in tetrahydrofuran (THF) in the presence of 18crown6 (18C6). The K_{eq} for the reaction: $C_6H_6^{-\cdot},K^+(18C6) + {}^{13}C_6D_6 = C_6H_6 + {}^{13}C_6D_6^{-\cdot},K^+(18C6)$ is 0.095 ± 0.008 at -100 ^oC. An analogous competition for electrons exists between [8]annulene and perdeuteriated-per-^{13}C-[8]annulene. In contrast to the benzene system the K_{eq} for the reaction: $C_8H_8^{-\cdot},Na^+ + {}^{13}C_8D_8 = C_8H_8 + {}^{13}C_8D_8^{-\cdot},Na^+$ in liquid ammonia is 1.17 ± 0.02 at -100 ^oC. The results are interpreted in terms of the divergence of the [6]annulene system from aromatic character upon electron addition and the convergence of the [8]annulene system towards aromatic character upon electron addition.

27

[8]ANNULENE PROTONATION OR DIMERIZATION TO FORM [16]ANNULENE. Richard D. Burton, Steven J. Peters, and Gerald R. Stevenson, Illinois State University, Normal, IL 61761.

Solutions of [8]annulene in the presence of its anion radical generates [16]annulene. The mechanism involves the dimerization of the [8]annulene anion radical followed by the comproportionation of the [16]annulene anion radical to the neutral molecule and dianion. This process does not take place in the presence of ion association. In the presence of proton donor, this process competes with the protonation of [8]annulene. However, this latter process does not take place in the absence of ion association. In conclusion, the [8]annulene system is thermodynamically unstable towards [16]annulene or protonation depending upon the solvent system.

28

A DSC STUDY OF THE PHASE TRANSITIONS IN HEXADECYLAMMONIUM TETRACHLOROCADMATE(II). J. E. House, Jr., and J. A. Burroughs, Illinois State University, Normal, IL 61761. Hexadecylammonium tetrachlorocadmate(II), $(n\text{-}C_{16}H_{33}NH_3)_2CdCl_4$, is known from x-ray analysis to undergo at least three phase transitions. However, a previous thermal study on this compound using differential scanning calorimetry (DSC) had revealed clearly only two transitions. In the present study, we have conducted an exhaustive DSC study which clearly reveals four phase transitions. Thermodynamic properties for some of these transitions have been determined. Also, the existence of thermal hysteresis has been determined as well as its dependence on heating rate.

29

A STUDY OF THE PHASE TRANSITION IN ANHYDROUS SODIUM ACETATE. Kathleen A. Kemper and J. E. House, Jr., Illinois State University, Normal, IL 61761. Anhydrous sodium acetate undergoes an irreversible phase transition at 512.6 K, and this transition has been studied using differential scanning calorimetry. The apparent enthalpy of transition and the transition temperature were found to be dependent on heating rate. The transition appears to be of the order-disorder type. Infrared spectra of the low temperature and high temperature forms showed changes in vibrational modes which indicate that the phase transition involves a change in the acetate anion environment.

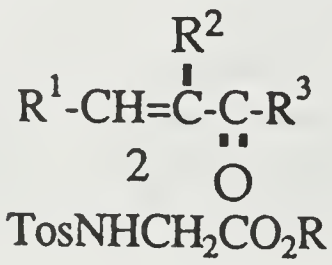
30

MATRIX ISOLATION PHOTOLYSIS OF METALLOPORPHYRIN COMPLEXES. J. F. Bautista, R. A. Watson, and K. S. Suslick, School of Chemical Sciences, University of Illinois, Urbana, IL 61801.

We have observed unusual photochemistry of transition metalloporphyrin perchlorates, periodates, nitrates, nitrites, and sulfates. Mn(TPP)(XO_4) (X=Cl,I; TPP = 5,10,15,20-tetraphenylporphyrinate(-2)) can be photochemically converted to Mn(TPP)(X) upon irradiation. Cr(TPP)(ClO_4) is converted to O=Cr(TPP) upon irradiation. Mn(TPP)(NO_3) and Mn(TPP)(NO_2) cleanly yield O=Mn(TPP). We believe that these reactions involve a similar mechanism, homolytic α-cleavage to produce M(TPP) (M=Fe,Cr,Mn) and ligand radical, which then either recombine to give starting material, to give O=M(TPP) and XO_n, or to yield $M^{\cdot+}$(TPP) or $OXO^{\cdot-}$. We are utilizing matrix isolation techniques to observe intermediates at low temperatures (10 - 100 K). Current progress towards this goal will be discussed.

31

SYNTHESIS OF PYRROLES FROM N-TOSYLGLYCINE ESTERS. Michael C. Hoehner and Timothy D. Lash, Department of Chemistry, Illinois State University, Normal IL 61761. Condensation of N-tosylglycine esters **1** with ∝,β-unsubstituted aldehydes and ketones **2** in the presence of the nonnucleophilic base DBU afforded the pyrrolidines **3**. Dehydration with phosphorous oxychloride-pyridine gave the corresponding pyrrolines **4**. Further treatment with DBU in refluxing THF or toluene induced the elimination of p-toluenesulphinic acid to give the pyrroles **5**. This versitile procedure has been utilized in the preparation of alkyl pyrrole intermediates needed in the synthesis of geoporphyrins.



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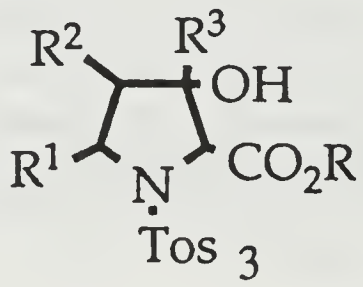

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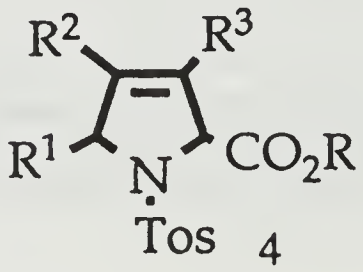

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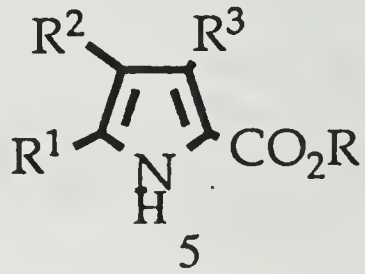

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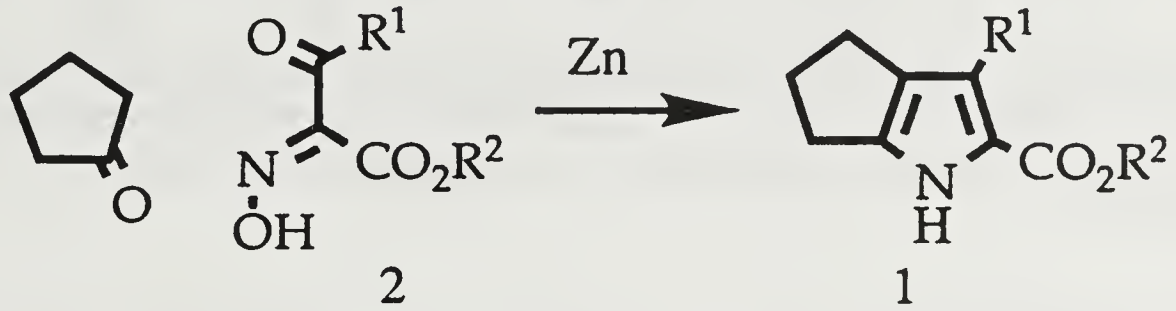
32

SYNTHESIS OF B-CYCLOPENTENOPYRROLES. Desiree M. Quizon and Timothy D. Lash, Department of Chemistry, Illinois State University, Normal IL 61761. In relation to our synthetic studies on geochemically significant porphyrins, we required multigram quantities of b-cyclopentenopyrroles **1**. These compounds are of some interest in their own right since several b-cyclopentenopyrroles have valuable pharmacological properties. Previous syntheses of b-cyclopentenopyrroles involved multiple steps and were not suitable for our studies. We report a new synthesis of **1** from cyclopentanone. Condensation of oximes **2**, obtained by nitrosation of readily available β-ketoesters, with cyclopentanone in the presence of zinc dust and sodium propionate in propionic acid at 150°C gave the desired pyrroles in moderate to good yields. The utility of these compounds in porphyrin synthesis will be discussed.



2 1

33

ALKYL PHENYLHYDRAZINES AS DERIVATIZING AGENTS FOR OLIGOSACCHARIDES. M. DeCroix, E.M. Allen, T.D. Lash, M.A. Jones, and J.W. Webb, Illinois State University, Normal, IL 61761.
Derivatization is a valuable technique for high performance liquid chromatographic detection of oligosaccharides and subsequent analysis by mass spectrometry for sequence and branching information. In this study, we will show the advantages of using hydrazines (4-butylphenylhydrazine to 4-tetradecyl-phenylhydrazine) as derivatizing agents for oligosaccharides. We have attempted to optimize derivatization conditions including reaction time and temperature as well as hydrazine/sugar mol ratios to obtain maximum yields. Examples will be presented for oligomers of glucose and N-acetyl glucosamine. (Supported by NIH HD24230-01(JWW,MAJ,EMA)

34

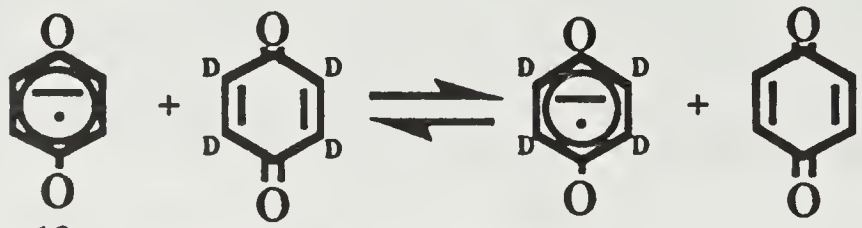
ALKYL ESTERS OF p-AMINOBENZOIC ACID AS DERIVATIZING AGENTS FOR OLIGOSACCHARIDES. V.L. Solanki, K. Fogarty, M.A. Jones, and J.W. Webb, Illinois State University, Normal, IL 61761.
Alkyl esters of p-aminobenzoic acid have been used as derivatizing agents for oligosaccharides. These derivatives improve detection by high performance liquid chromatography (HPLC) and enhance structural analysis by mass spectrometry (MS). In addition, MS analysis is further improved by increasing the hydrophobicity of the alkyl chain length. This paper describes the preparation of a series of alkyl esters of p-aminobenzoic acids and their use as derivatizing agents for oligosaccharides. Derivatization conditions such as reaction time and temperature and reagent/sugar mol ratios were optimized to maximize yield. Oligomers of glucose and N-acetyl glucosamine and complex oligosaccharides were derivatized, purified by HPLC, then subsequently analyzed by MS. (Supported by NIH HD24230-01 (JWW and MAJ) and Baxter Healthcare (KF).

40

35

ZERO-POINT ENERGY EXPLANATION OF ISOTOPE EFFECTS UPON ELECTRON AFFINITY. Craig M. Sebenik and Gerald R. Stevenson, Illinois State University, Normal, IL 61761.

We have found that when perdeuteriated benzoquinone and benzoquinone compete for an insufficient number of electrons the isotopically light material is predominate.

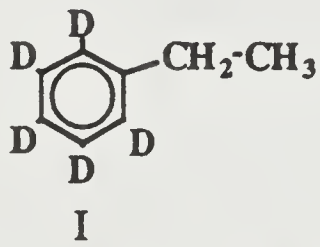


This is also true when ^{13}C substituted benzoquinone replaces the perdeuteriated system. We have developed a theoretical model based upon zero point vibrational energies that describes our observed perturbation in solution electron affinity upon isotopic substitution.

36

SEPARATION OF ISOTOPOMERS. James T. Ciszewski and Gerald R. Stevenson, Illinois State University, Normal IL 61761.

Isotopomers, that is molecules that only differ by the site of isotopic substitution (such as I and II), cannot be separated by any physical method available to date. This is due to the fact that isotopomers have identical physical properties, such as masses and vapor pressures.



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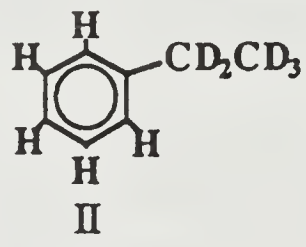

II

However, we have discovered that the anion radicals of several isotopomers have different solution electron affinities. Because of this, we have used an equilibrium of the type shown below to separate several isotopomers.

37

THE EFFECT OF AROMATIC SOLVENTS ON THE REACTION OF CARBOETHOXY-CARBENE WITH HYDROCARBON SOLUTES. Curt A. Dvorak, Amy Youngman and JoAnn P. DeLuca, Illinois State University, Normal, IL 61761. In experiments carried out earlier in this laboratory, small, but significant differences in product ratios were found in the reactions of carboethoxycarbene (generated by the photolyis of ethyl diazoacetate) with pentane and with 2,5-dimethylhexane in pentane vs. benzene solution. In work reported here, the generality of the solvent effect has been further demonstrated in experiments involving 2,3-dimethylbutane and 2,3-dimethyl-2-butene as solutes. We are interested in the possibility that this solvent effect may be due to complexation of the carbene by the aromatic solvent. In order to explore the importance of the pi-donating ability of the aromatic ring to the solvent effect, additional aromatic solvents, including toluene and anisole, are now being investigated and the results of these experiments will be reported.

38

SYNTHESIS of β-NITROVINYL COMPOUNDS FROM METHYLARENES. Homer A. Smith, Jr., Millikin University, Decatur, IL 62522 and E. Campaigne, Indiana University, Bloomington, IN 47401. A three-step procedure for conversion of the aryl methyl group into the β-nitrovinyl moiety is described. The procedure, which obviates the intermediacy of difficultly accessible aldehydes in the conventional route, involves arylidene dibromide and aldimine (Schiff base) intermediates. Treatment of various methylarenes with two equivalents of N-bromosuccinimide in carbon tetrachloride gave clean conversion to arylidene dibromides in fair to excellent yields. Treatment of the dibromides with excess butanamine afforded the corresponding N-butylaldimines in good yields. Treament of aldimines with nitromethane in acetic acid gave the corresponding β-nitrovinyl arenes in good to excellent yields. β-Nitrovinyl compounds are useful precursors to β-aminoethyl compounds; in addition, the dibromide and aldimine intermediates prepared in this study may serve generally as aldehyde synthons in reactions with nucleophiles.

39

EFFECTS OF SOLVENT DEUTERATION UPON ANION CHEMISTRY. M. Kent Ballard and Gerald R. Stevenson, Illinois State University, Normal, IL 61761.

The interaction between the sodium nucleus and the naphthalene anion radical was found to be slightly less intimate in perdeuterated tetrahydrofuran (THF-d8) than it is in protiated (normal) THF as evidenced by the smaller sodium hyperfine coupling constant observed for the ion pair in the isotopically heavier solvent. This decrease in A_{Na} measured by EPR with a Gauss meter ($\Delta A_{Na} = 10.80 \pm 3.63$ G) is interpreted in terms of a small decrease in the equilibrium constant controlling the concentrations of tight ion pair and solvent separated ion pair $\{C_{10}H_8^{-\cdot},Na^+ = C_{10}H_8^{-\cdot}//Na^+\}$ upon perdeuteriation of the solvent. After longer periods of time the anion radical is deuteriated by the solvent.

40

THE ENRICHMENT OF RADIOACTIVE SODIUM. Troy D. Halvorsen, James T. Ciszewski, Kerry Reidy, and Gerald R. Stevenson, Illinois State University, Normal, IL 61761.

A mixture of radioactive ^{22}Na and cold ^{23}Na was used to reduce naphthalene to its anion radical. It was found that the radioactive sodium acts as a better reducing agent than does the "cold" sodium. The equilibrium constant for the reaction: $*M + \pi^{-\cdot},M^+ = M + \pi^{-\cdot},*M^+$; is perturbed from unity. This fact has been utilized to separate the radioactive and "cold" isotopes of this metal. Further, the separation factor (α) describing the room temperature separation of ^{22}Na from ^{23}Na is a function of the solvent system utilized.

42

41

MECHANISM OF DEHYDRATION OF AQUAPENTAMMINECOBALT(III) COMPLEXES. Debbie G. Beck and J. E. House, Jr., Illinois State University, Normal, IL 61761. The loss of water from $[Co(NH_3)_5H_2O]X_3$ (where X = Cl^-, Br^-, I^-, or NO_3^-) shows a strong dependence on the nature of the anion. Accordingly, the reaction historically has been interpreted as an S_N2 process. Reactions in solids more commonly involve processes of nucleation or diffusion and may follow any of several rate laws. Using the method of Reich and Stivala to determine the mechanism, the dehydration of $[Co(NH_3)_5H_2O]Cl$ has been studied and in no case did the kinetic data indicate a first or second order rate law. In fact, out of 32 runs, approximately 85% follow an Avrami type of rate law. This rate law is known to apply to cases where the rate is controlled by diffusion. The loss of water from $[Co(NH_3)_5H_2O]I_3$ has also been studied and the mechanism of dehydration elucidated.

42

DETERMINATION OF FLIP-FLOP KINETICS OF STEARIC ACID NITROXIDES BY PHOTOREDUCTION

P. Yuann and P. D. Morse II, Department of Chemistry, Illinois State University, Normal, IL 61761-6901

The nitroxides of doxyl stearic acid (N-DS) are potential contrast agents for magnetic resonance imaging. To better understand their distribution and chemistry in living systems, we are studying distribution within and across model phospholipid bilayers (liposomes). N-DS are free radicals and give EPR signals; when N-DS are chemically reduced, the EPR signals disappear. Initially, N-DS in liposomes are distributed equally in both the outward and inward facing halves of the bilayer. We photoreduce flavin mononucleotide which is outside the liposomes which then rapidly reduces the N-DS in the outer half of the bilayer. As N-DS flip from the inner to outer bilayer, the remaining N-DS are reduced, too. The rate of signal loss is evaluated to determine the rate of transbilayer flip-flop which, for N-DS, are on the order of seconds. This is surprisingly rapid compared to phospholipid flip-flop which occurs over hours. We conclude that N-DS molecules can distribute rapidly in cells and are probably not localized in specific cell membranes.

Supported by NIH Grant 1 R15 44365-01

43

CHANGES IN MEMBRANE FLUIDITY INDUCED BY THE CRYOPROTECTANT TREHALOSE.

K.Haskell. M.A. Jones, S.K. Webel.and P.D. Morse II. Illinois State University,Normal, Il 61761.

The structural integrity of cell membranes is critical for the preservation of cells. We used a simple membrane system (liposomes) as a model to develop cryopreservation procedures. The solubility of a spin label (TEMPO) in the hydrophobic region of the liposome was examined as a function of temperature and concentration of trehalose (cryoprotectant) and sodium chloride (control). Experiments were performed at 55°C, which was above the phase transition of the phospholipids in the liposomes. Trehalose caused TEMPO to be less soluble in the hydrocarbon region of the membrane. We interpreted this to mean that trehalose increased the order of the hydrophobic region of the liposome when the hydrocarbon region is in the liquid state. The results suggest that cryoprotectants act by decreasing the fluidity of membranes.

Supported in part by the Illinois Pork Producers.

44

MICROWAVE ESTERIFICATIONS. Brad S. Hughes, J. Chai, A. D. Glover, K. W. Field, and K. E. Kolb, Department of Chemistry, Bradley University, Peoria, IL 61625. Work has continued on the development of the use of conventional microwave ovens for the rapid esterification of small quantities of various alcohols with acetic acid. In a typical run 0.16 mL (1 mmol) of 1-octanol is reacted with 0.50 mL (8 mmol) of acetic acid containing 2 volume percent of sulfuric acid. At a 10 percent power setting, esterification of the alcohol is over 90 percent in 2.5 minutes.

45

A NEW METHOD FOR DETERMINING CARBOXYLIC ACID CONTENT IN STARCH. C. Dolly, M. Weinstein, P. Method, A. E. Staley Co., Decatur, IL 62525, R. Beckwith and E. Acheson, Millikin University, Decatur, IL 62522. Unmodified starch does not contain any carboxylic acid groups. Starch can be modified during processing, and the extent of modification can be determined by measuring the resulting carboxylic acid content. The carboxylic acid content is used as a "fingerprint" to characterize the probable chemical behavior of the starch in industrial processes. It is therefore important that an accurate and reliable method be available for determining the carboxylic acid content. The currently used method is not suitable for the analysis of pre-gel starches, and is subject to numerous sources of error. The new method involves using microwave ashing to convert carboxylic acid groups to carbonates, reaction of the carbonates with sulfuric acid, and automatic back-titration of the excess sulfuric acid. The new method is more accurate and precise than the old method, and can be applied to all starches, unlike the old method.

46

THE SYNTHESIS OF METHOXYBENZENES. S. M. Adamski and K. W. Field, Department of Chemistry, Bradley University, Peoria, IL 61625 and G. B. Schuster, Department of Chemistry, University of Illinois, Urbana, Illinois 61801. The electron donating abilities of methoxybenzenes in electron transfer reactions are currently under investigation in our laboratories. Eight of the twelve methoxybenzenes are commercially available. The synthesis of the remaining four materials, 1,2,3,4- and 1,2,4,5-tetramethoxybenzene, pentamethoxybenzene, and hexamethoxybenzene will be discussed.

47

METAL COMPLEXES OF TETRAAZACYCLES WITH COORDINATING PENDANT ARMS. S. A. Frank and D. X. West, Illinois State University, Normal, IL, 61761.

Metal complexes of macrocylic ligands are of considerable interest because of their high stability and unusual redox properties. When the macrocycle possesses pendant arms with fundamental groups capable of coordinating to the metal ion, a competition can exist between the cyclic and azacyclic donors. We report the synthesis of additional complexes involving these ligands and our efforts to establish their nature.

48

DEGREE OF ISOMERIZATION IN FRIEDEL-CRAFTS ALKYLATIONS. Brian S. Hughes, M. T. Cygan, K. W. Field, and K. E. Kolb, Department of Chemistry, Bradley University, Peoria, IL 61625. The development of an organic laboratory experiment will be discussed which illustrates several of the factors that determine the degree of alkyl group rearrangement during Friedel-Crafts alkylation. Specifically, the results of alkylations of various aromatic substrates, e.g. p-xylene and mesitylene, with 1-halobutanes catalyzed with aluminum chloride will be discussed.

49

METAL COMPLEXES OF LARGE POLYDENTATE LIGANDS AND THEIR BIOLOGICAL ACTIVITY. A. C. Whyte, D. X. West, and A. E. Liberta, Illinois State University, Normal, IL, 61761.
Metal complexes of sulfur containing ligands, such as dithiocarbamates, thioureas, and thiosemicarbazones have received considerable attention because of their potential for useful biological activity. We have prepared copper(II) and nickel(II) complexes of large ligands containing both of the latter functional groups. We report the synthesis of these ligands, the characterization of the metal complexes and their ability to inhibit fungal growth.

50

THE DEAMINATION OF ALIPHATIC AMINES. K. W. Field and D. Bettebenner, Department of Chemistry, Bradley University, Peoria, IL and E. H. White, Department of Chemistry, The Johns Hopkins University, Baltimore, MD 21218. (R)-N-(1-Phenylethyl)-N-nitroso-2-naphthalenecarboxamide was prepared and decomposed in dioxane, methylene chloride, ethanol, and acetonitrile. The rates of decomposition were measured as was the enantiomeric excess in the resulting ester. A multi-step mechanism has been proposed for the rearrangement. The first step is believed to involve rearrangement to the diazo ester, which is ultimately followed by nitrogen elimination and finally product formation.

51

REGIONS OF CONVERGENCE, COMPUTER GRAPHICS, AND OCTANTS.
P. J. C. Lamont, Western Illinois University, Macomb, IL 61455.
Computer graphics images of intersections of planes with subsets $S = \{\xi_0 \mid N\xi_k \le c \quad \forall\ k \le t\}$ of octant (i.e. Cayley) eight space generalize the Mandelbrot and Julia sets. Scalar constants c and t are bounds. Variable sequences of octants ξ_k are defined for positive integer k by $\xi_k = \xi_{k-1}^2 + \alpha$ where α is a constant octant and ξ_0 is allowed to vary as an octant with real coefficients. The norm $N\xi$ of octant ξ is the sum of the squares of the components of ξ. For $c = 4$ and $t \ge 150$, Argand diagrams give Mandelbrot or Julia sets. For planes other than the complex plane, new sets and images are obtained.

52

OCTANTS AND CRYPTOGRAPHY. P. J. C. Lamont and Duckkyung Kim, Western Illinois University, Macomb, IL 61455. This paper describes the implementation of a cryptographic system using the arithmetics of Cayley's classical algebra. A prototype, using 100 norm 3 codewords, running on an International Business Machines Personal Computer AT with Turbo Pascal as programming language and a space character as delimiter between variable length frames gave interactive encryption and decryption without delay, an information rate with an upper bound of 10 bits per character, and a maximum frame length of 18 before single precision overflow. In view of the time required to perform exhaustive search factorization, the number of parentheses patterns, the fact that codewords may have diverse components and patterns of sign, the fact that bases can be changed, and the choice of order and orders in the decryption algorithm, it would appear that plaintext attack is time consuming and that systems may be judged secure.

53

COMPUTER GRAPHICS PRIMITIVES FOR USE IN IDENTIFICATION OF SCANNED IMAGES OF COCCIDIA. L.H.Tichenor, Western Illinois University, Macomb, Il. 61455, and T.E.McQuistion, Millikin University, Decatur, Il. 52522. The length and width of Isosporan oocyst substructures (including outer and inner wall, sporocyst, and polar granules) are determined along with general sporocyst structure from graphics "objects" identified in scanned photomicrographs. These factors are used to develop a rule based computer system to distinguish between I.daphnensis and I.geospizoe.

54

POSSIBLE EARLY PENNSYLVANIAN ANCESTOR OF THE CYCADALES. Richard L. Leary, Geology Department, Illinois State Museum, Springfield, IL 62706. A specimen of the Pennsylvanian foliage genus Lesleya has been found with two rows of ovule-bearing receptacles on opposite sides of the petiole. This specimen is from the Early Pennsylvanian (Namurian B or C) of Rock Island Co., Illinois. The fertile portion of this specimen is very similar to Phasmatocycas kansana Mamay from the Early Permian of Kansas and Texas. The latter ovule-bearing organ was found attached to the base of Taeniopteris by Gillespie and Pfefferkorn. Mamay interpreted Phasmatocycas as an ancestral form to cycads. This material provides additional evidence that cycads were derived from plants with entire leaves. Lesleya and its attached fertile petiole are proposed as ancestors of Taeniopteris, Phasmatocycas, and, ultimately, the modern cycads. This extends the age of known precursors of cycads back from the Early Permian to Early Pennsylvanian, approximately 35 million years earlier.

55

LITHOLOGIC CHARACTER OF THE SILURIAN BEDROCK AQUIFER NEAR LEESVILLE IN NORTHEASTERN IROQUOIS COUNTY, ILLINOIS. Philip C. Reed, Walter J. Morse, Illinois State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820, and Stuart J. Cravens. Illinois State Water Survey, 2204 Griffith Dr., Champaign, IL 61820. Silurian bedrock is the principal aquifer for municipal and irrigation groundwater supplies in the Leesville area. The aquifer consists of 450 feet of siliceous dolomite overlain by 100 feet of Quaternary sediments. Sedimentary feature characterization of the upper 100 feet of the aquifer was accomplished with microphotographs of sample cuttings, natural gamma and caliper logs at seven locations within a two-square mile area. In cross section, apparent dip is 27 feet per mile and the Silurian bedrock surface is irregular, with as much as 20 feet of relief. Bedding plane openings and secondary mineralization attests to solution development of porosity and permeability in the sucrosic dolomite and chert in the aquifer. Transmissivity values at seven pump test sites range from 14,000-122,000 gpd/ft. Specific capacities ranged from 4-82 gpm/ft. This study indicates that well yields may be limited in the upper 100 feet of dolomite south of Leesville.

56

A TRANSLATION-INVARIANT FEATURE FOR 2-D DISCRETE IMAGES. Jen-Shiun Chen, Ragupathy Bollini, and Luis Youn, Electrical Engineering Dept., Southern Illinois University, Edwardsville, IL 62026. A feature for the identification of 2-D discrete images is presented that is independent of image translation. Given a 2-D discrete image with M by N pixels and its corresponding 2-D discrete Fourier Transform, the feature is defined as $P_{i,j} = (F_{j,j} F_{i,i}) / (F_{i,j} F_{j,i})$, where $F_{i,j}$ is the value of the Fourier Transform at the coordinate (i,j). A total of M-1 by N-1 complex feature values can be calculated for the image. It can be shown that such feature values are independent of image translation and therefore is useful for image identification.

57

CONSIDERATIONS IN PLANNING OF SMALL POWER PRODUCING FACILITES. L. Youn, R. Bollini, J. Chen, Southern Illinois University at Edwardsville, IL 62026. The installation of small power producing facilities in the utility user's premises is becoming popular as the various provisions of the Public Utility Regulatory Policies Act (PURPA) allow the small power producer to increase his operational flexibility with respect to local utility. The planning study includes cost minimization, maximization of reliability of the samll power producer's system , sizing of installed capacity of on-site generation, contractual amount of power from utility, number of generating units for on-site generation, and optimal operation of small power producing facilities. The planning algorithm based on the analytical production costing model.

58

EFFECTS OF 2,4,6-TRINITROTOLUENE (TNT) ON INITIAL ROOT GROWTH. W. L. Tucker, W. L. Banwart, and J. J. Hassett, University of Illinois, Urbana, IL 61801. Sponsors of research US Army, USA THAMA, and USA CERL. The objective of this study was to identify plants that would germinate and grow in soils contaminated with 2,4,6-trinitrotoluene (TNT). A three phase project was designed to measure the effect of TNT on initial rooting response: phase 1, incubator germination in petri-plates on TNT treated filter paper; phase 2, incubator germination in petri-plates with TNT spiked soil; and phase 3, greenhouse germination in a TNT spiked soil. The five most tolerant plant species identified in phase 1 were: big bluestem, indiangrass, little bluestem, oat, and side-oats grama. Phase 2 indicated that big bluestem was the most tolerant plant as it expressed no significant root reduction at soil concentrations of 200 and 400 mg TNT kg^{-1}. In phase 3, the plants were germinated in the greenhouse which allowed for limited environmental stress. The plant species identified as being most tolerant in phase 3 were little bluestem and oat. These two plants were the only plants that did not show significant root reduction at a soil concentration of 200 mg TNT kg^{-1}. Big bluestem, little bluestem, and oat were the most consistently tolerant species across all phases.

59

THE USE OF A BUBBLE CURTAIN TO REDUCE FISH MORTALITY RESULTING FROM UNDERWATER EXPLOSIONS. T. M. Keevin, G. L. Hempen, L. G. Nico and *D. Schaeffer. U.S. Army Corps of Engineers, St. Louis, MO. 63101 and *University of Illinois, Urbana, IL. 61801. The St. Louis District is using controlled underwater blasting to demolish Locks and Dam No. 26 on the Mississippi River at Alton, IL. Federal and state fish and wildlife agencies were concerned with the potential for fish kills during demolition. Bubble screens have been routinely used to reduce structural damage from underwater explosive pressures. However, the effectiveness of bubble curtain use in reducing impacts to aquatic life was unknown and untested. The St. Louis District evaluated bubble curtain use for reducing fish mortality in a series of controlled tests with caged bluegill and channel catfish at 4, 8, 12 and 15 meters away from a 4 pound high explosive charge. A significant reduction in fish mortality was found when the bubble curtain was employed during tests with caged fish. Bubble curtain deployment effectively reduced the fish kill radius associated with underwater explosive pressures.

60

EFFECTS OF KETO-ACIDOSIS AND HYPERGLYCEMIA ON FUNGICIDAL ACTIVITY BY CULTURED MURINE MACROPHAGES. D. Webb, R. Hughes, R. Soltys, P. Soncasie, and D. Kitz. S. Illinois Univ. at Edwardsville, IL 62026-1651. Diabetics are known to experience suppression of their phagocytic cell immune response due to hyperglycemia and keto-acidosis. Such immune suppression is thought to contribute to increased opportunistic infections in persons with diabetes. Utilizing macrophage cell lines derived from the bone marrow of AKR mice, we have examined the effect of individual ketone bodies: acetoacetic acid, hydroxybutyric acid, and acetone; and of glucose, on the ability of these cells to kill the yeast Candida lusitaniae. Individual ketone bodies were found to depress fungicidal activity at physiological levels seen in diabetic serum. Differences in fungicidal activity were not due to lower levels of phagocytic activity, but attributed to less effective killing of intracellular yeasts. Preliminary studies examining the effects of combinations of ketone bodies and glucose on macrophage fungicidal activity will be reported, as will the ability of lymphokines to boost "diabetic macrophage" killing of C. lusitaniae. This work was supported by a Cottrell College Science Grant and the American Diabetes Assoc., Downstate Ill. Affil., Inc.

61

IN VIVO SUSCEPTIBILITY OF CHEMICALLY AND GENETICALLY DIABETIC MICE TO OPPORTUNISTIC YEAST PATHOGENS. R. Soltys and D. Kitz. Southern Illinois Univ. at Edwardsville, IL 62026-1651. The disease diabetes mellitus can cause physiological aberrations (hyperglycemia and keto-acidosis) which are known to decrease host resistance to opportunistic pathogens. Utilizing genetically diabetic C57Bl/KsJ db/db and alloxan-treated (AKR & DBA/2) chemically diabetic mice we found that these mice had increased susceptibility to intravenous challenge with the yeasts Cryptococcus neoformans, Candida albicans and C. lusitaniae compared to db/+ or non-alloxan treated controls. Susceptibility was measured by the number of CFU present in organ homogenates (spleen, liver and kidney) with results expressed as CFU/gram of tissue (dry weight). We have also found that the lymphokine human tumor necrosis factor-alpha (Genentech, Inc.) can boost organ clearance rates of yeasts in diabetic mice. These results suggest a possible role for immune-modulating lymphokines as adjunct therapy for diabetics with infections. This work was supported by a Cottrell College Science Grant and the American Diabetes Association, Downstate Illinois Affiliate, Inc.

62

2-ARYLINDENES AS FLUORESCENT ESTROGEN RECEPTOR LIGANDS.
G.M. Anstead and J.A. Katzenellenbogen, University of Illinois, Urbana, IL 61801.
A series of 2-arylindenes were evaluated as fluorescent ligands for the estrogen receptor (ER). Such fluorophores have been proposed to quantitate the ER in individual cells, thereby providing a prognostic technique in the management of breast cancer. The short wavelength emission of the 6-hydroxy-2-arylindenes could be bathochromically-shifted by a nitro group in the 3- or 4-position of the 2-ring. However, the ER binding affinity of these ligands was decreased about 14-fold. A hydroxy group in this position enhanced binding affinity 3-fold. X-ray crystallography of indenes substituted in the 2-position of the 2-ring or in the 1-position suggested that ER binding affinity is inversely related to the planarity of the ligand about its long axis. 2-(2-Methylphenyl)-3-phenyl-6-hydroxyindene had the highest binding affinity in the series (comparable to estradiol). The orientation of 2-arylindenes in the ER binding site depends on the group in the 3-position. If the 3-substituent is ethyl, the 2-ring mimics the steroidal A-ring; if the 3-substituent is aryl, the fused ring acts as the A-ring surrogate. The fundamental problems in fluorescent ER ligand design are: (1) reaching a compromise between the relative planarity required for high emission intensity and the precise three-dimensional shape required for high ER binding affinity and (2) incorporating a donor-acceptor fluorophore system without drastically decreasing the binding affinity.

63

ULTRASTRUCTURE OF THE PERITONEUM IN PERITONITIS. J.K. Lloyd, O.A. Schjeide, Northern Illinois University, DeKalb, IL 60115 and J.W. Dobbie, Baxter R&D Europe Nivelles (Belgium).
In peritoneal dialysis, peritonitis, a bacterial inflammation of the peritoneum, is a major cause of morbidity, hospitalisation, and transfer to hemodialysis. Electron microscopy studies (TEM and SEM) were performed on seventy-two peritoneal biopsies from patients on peritoneal dialysis with an history of previous episodes of peritonitis. Twenty-four patients who had normal peritoneal morphology which included a mesothelial layer with microvilli and a single basement membrane overlying a fibrous stroma had an average of 2.8 episodes of peritonitis. Forty-eight patients who depicted loss of mesothelium and fibrin deposition of various thickness on the surface had an average of 4.1 episodes of peritonitis. In some cases, reduplication of basement membrane was observed. Stromal changes were oedema and an increase in proliferative fibroblasts. A few specimens demonstrated macrophages, acute inflammatory cells and bacteria. These findings are important in determining the significance of repeated episodes of peritonitis in the induction of morphological change in the peritoneum in peritoneal dialysis.

64

A HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC METHOD TO QUANTITATE SERUM AND URINE CONCENTRATIONS OF AMINOTHIADIAZOLE IN HUMAN SUBJECTS. W.L. Strond, Evanston Hospital, Evanston, IL 60201. The following method was developed to allow the oncologist to detect and determine the concentration of the antineoplastic agent, aminothiadiazole (ATDA) in the serum and urine of human patients. This procedure was based on the extreme solubility and stability of ATDA in 4.0N HCl (20 times more soluble than water). The use of Bond Elut® solid phase extraction columns (2-OH DIOL for serum, and LRC SCX for urine) before chromatographic analysis proved to be an efficient means of extracting ATDA from both biological matrices. After acidification, freezing, and centrifugation, chromatographic analysis was performed using the following isocratic method: (1) The Column type was a Waters C18 Radialpak™ μBondapak™ cartridge radially compressed in a Waters Z-Module™. (2) The Flow rate of 0.6 ml/min. (3) The Mobile phase was composed 1% methanol in sterile water with 25 ml of the mobile phase modifier octanesulphonic acid (Pic® B8 reagent) adjusted to pH range of 3.0-3.1 by adding 25 ml of a sodium acetate / hydrochloric acid buffer. (4) UV detection at 254 nm. ATDA had a retention time of approximately 18 minutes and displayed a linear detector response from the nanogram through the milligram range.

65

PURIFIED COMPONENTS OF THE EXTRACTS OF ZINGIBER OFFICINALE THAT INHIBIT THE MULTIPLICATION OF CYANOPHAGE LPP-I. Alain Decastro and Amrik S. Dhaliwal, Department of Biology, Loyola University of Chicago, IL 60626. Purified components of zingiber officinale, such as furfural, heptane, 2-heptanone, citral, ethyl acetate, starch, camphor, glycine, and lauric acid were diluted in saline and were tested for their ability to inhibit the replication of cyanophage LPP-I. Each diluted (0.1 to 10.00%) was mixed in equal proportion with cyanophage LPP-I and was incubated for various time intervals at room temperature. After each incubation time, samples of the incubated mixtures were plated with three week old virus host plectonema boryanum. Plates were placed under 200 ft.C. light intensity at room temperature before the plaques were counted. Each component showed some inhibitory effect on the virus replication and these effects were statistically significant.

66

INHIBITORY EFFECTS OF ZINGIBER OFFICINALE ON THE REPLICATION OF CYANOPHAGE LPP-I Lisa Y. Lee and Amrik S. Dhaliwal, Loyola University of Chicago, Chicago, IL 60626. Zingiber Officinale was washed, blot dried, and macerated with pestle and mortar. The extract was prepared with 0.1M phosphate buffer. tris buffer, and saline. The extract was centrifuged at 10,000 rpm for 30 minutes and the supernatant was used for experimental purposes. The extract was stored for seven days at room temperature, 4°C, and 0°C to test for stability of inhibition. Furthermore, the extract was heated to 50°C, 80°C, and boiling temperatures for 10, 20, and 30 minute time intervals before it was tested for its inhibitory ability. Attempts were also made to isolate the inhibitory components of zingiber by using sephadex G-100 column. The column was prepared with neutral phosphate buffer. From these experiments, results indicated that phosphate buffer and saline solution extract showed stable inhibition at room temperature, and 4°C. Exposing the extract to 50°C and 80°C for 30 minutes did not affect the inhibitory activity of the extract, but boiling temperatures did destroy it. Through column chromatography, it was possible to concentrate the activity in few fractions although some inhibitory activity was found in most of the fractions collected.

67

ENHANCEMENT OF HIGH SCHOOL BIOLOGY TEACHERS THROUGH IN-SERVICE WORKSHOPS. W. J. Sundberg. Department of Plant Biology, Southern Illinois University, Carbondale, IL 62901. In 8 years, over 130 high school (= HS) biology teachers from Missouri, Illinois, Indiana, Kentucky, and Arkansas participated at SIU in NSF-supported, in-service, enhancement Institutes in Microbiology. Teacher preparation varied--some lacked a biology degree and many lacked formal work in microbiology and/or mycology. Emphasis focused on knowledge upgrades in (a) microbiology, mycology, protozoology, and human genetics or (b) cell-molecular biology and human genetics coupled with research participation. Using microbes in hands-on activites to teach biological principles throughout the school year was stressed. Due to variations in Institute designs, teachers received instruction for (a) nine academic year (= AY) Saturday workshops, (b) nine AY Saturday workshops plus a summer session (c) nine AY Saturday workshops, a summer session, and three to eight more AY Saturday workshops, or (d) seven AY weekend workshops, a summer session, followed by nine and three AY weekend workshops in the next two years, respectively. Evaluations and post-Institute comments indicate all time formats were productive. Qualitative improvement was evident in the hands-on laboratory activites in the teacher's classrooms. But, longer formats allowed time to more effectively develop new skills, carry out (rather than just discuss) laboratory exercises, and develop more creative lessons for integration into the HS curriculum. Participants are passing on ideas and concepts learned to other teachers in their area through "outreach" activites.

68

OPERATION PHYSICS: BUILDING A FOUNDATION FOR SCIENTIFIC LITERACY IN ILLINOIS. Alan M. Voelker. Department of Curriculum and Instruction, Northern Illinois University, DeKalb, IL 60115. In 1990, the ISAS received a grant from the Illinois State Board of Education entitled Operation Physics: Building a Foundation for Scientific Literacy in Illinois. The project was funded as part of the legislative directive to enhance scientific literacy in Illinois. The purpose of the project was to train leadership personnel who would help implement Operation Physics (a program developed by the American Institute of Physics) in Illinois elementary and middle schools. This presentation will provide an overview of Operation Physics; describe the two-week training program conducted in July and August, 1990; and, suggest ways that the ISAS can help educational agencies promote the improvement of physics teaching and children's learning in Illinois schools.

69

A STRATEGY DEVELOPMENT MODEL FOR EDUCATIONAL/TRAINING PLANNING IN DEVELOPING NATIONS. R. N. Woll, N. Woll and Company Inc., San Jose, Ill 62682. This paper is a case study based on research conducted in Costa Rica during the period of January to June 1990. Academic and industrial areas were studied pertaining to the preparation of a five year plan for the development of electronic and high technology industries. Additionally basic education was viewed and analyzed as it relates to preparation for entry into technical and engineering studies in the secondary and post secondary levels.

70

CIRCULATING AND GONADAL HORMONE LEVELS IN SEXUALLY ACTIVE AND QUIESCENT MALE WOODCHUCKS (*Marmota monax*). A. G. Amador[1], I. Sinha Hikim[2], A. Woolf[2], A. Bartke[2] and L.D. Russell[2], Southern Illinois University, [1]Springfield, IL 62794, and [2]Carbondale, IL 62901.
Woodchucks have a brief breeding season shortly after arousal from hibernation. The present study was designed to determine the differences in endocrine status between sexually active and quiescent woodchucks. Hormone levels were determined by solid-phase RIAs using ^{125}I-tracers. Serum estradiol as well as testicular 17-OH-progesterone levels were higher in active versus quiescent animals. In contrast, serum thyroid hormones levels were higher in quiescent when compared to active animals. Ratio analyses suggests that active woodchucks have a higher activity of the 17-hydroxylase/C17-20-lyase cytochrome P-450HL complex. The present results indicate that gonadal quiescence in the woodchuck is accompanied by reduced testicular and increased thyroid functions, as evidenced, in part, by the changes in ratios.

71

THE PHARMACOLOGIC CONTROL OF COCCIDIAN PARASITES IN GAME-FARM REARED CHUKAR PARTRIDGES IN ILLINOIS. Stacey Hart and T. E. McQuistion, Millikin University, Decatur, Illinois 62522. Coccidial parasite isolates were obtained from the litter and intestinal tracts of dead and dying, three-five week old chukar partridges reared at a game farm in Southern Illinois. A series of experiments were conducted to determine (1) the species of coccidian parasites present in the birds, (2) the prevalence of each parasite species and (3) the coccidiocidal or coccidiostatic action of sulfamethazine, monensin and amprolium against these parasites. Two coccidial species were found. Eimeria alectoreae represented 87% of the oocysts recovered while a small, spherical-shaped heretofore undescribed species represented 13% of the oocysts recovered. Because E. alectoreae represented the majority of oocysts infecting the chukars, drug efficacy tests were conducted only with E. alectoreae. Amprolim (0.0125% in feed rations) showed little coccidiocidal or coccidiostatic control against E. alectoreae while monensin (0.0120% in the feed ration) showed both coccidiocidal and coccidiostatic activity. Sulfamethiozone (0.0970% in the drinking water) showed complete coccidiostatic activity but only slight coccidiocidal activity.

72

GENETICS OF COTTONTAIL RABBITS IN SOUTHERN ILLINOIS
D. Shoemaker and *L. Seeb, Cooperative Wildlife Research Lab., *Cooperative Fisheries Research Lab., Dept. of Zoology, Southern Illinois University, Carbondale, IL 62901.
Few investigators have studied the genetic variability of eastern cottontail rabbits (Sylvilagus floridanus). The purpose of this study was to investigate the genetic population structure of cottontail rabbits at Wayne Fitzgerrell State Park (WFSP), southern Illinois. Allozymes from heart and liver tissue were examined by horizontal starch gel electrophoresis from 163 rabbits taken by hunters 17-23 December 1988 from 2 major zones within WFSP. Polymorphisms were found at 12 of 29 loci screened. Significant differences in allele frequencies between the 2 zones were observed at 4 loci, and these differences are consistent with the history of the rabbit population at WFSP. Founder effects following a die-off in 1980, along with isolation of habitats within WFSP which restricted gene flow, appear responsible for the observed differences in allele frequencies between zones.

73

AN EVALUATION OF THE RIDGE-MAZE PATTERN ON SURFACE EPITHELIAL CELL MEMBRANES AS A SYSTEMATIC CHARACTER IN THE FAMILY PERCIDAE.
T. M. Keevin and L. M. Page. Center for Biodiversity, Illinois Natural History Survey, 607 East Peabody Drive, Champaign, IL 61820. Fishelson (1984, Zoomorphology 104: 231-238) suggested that the complicated ridge-maze patterns on the surface of epithelial cell membranes of fish scales were species specific and could be used in taxonomy. To test these hypotheses we examined the ridge-maze pattern of 40 species in the family Percidae using scanning electron microscopy techniques. We determined that the ridge-maze pattern did not vary with age, sex or season in Etheostoma simoterum and appears to be population specific in all species examined. However, an examination of a number of populations of Percina ouachitae demonstrated that the pattern is highly variable across the species' range and showed no discernable clines. For this reason it appears that the ridge-maze pattern has no value in constructing phylogenies among species in the family Percidae.

74

THE INFLUENCE OF pH AND BICARBONATE CONCENTRATION ON AMMONIA AND UREA PRODUCTION IN FRESHWATER FISHES. P. D. Fabsits and C. J. Costa. Eastern Illinois University, Charleston, IL 61920. Freshwater fishes use ammonia as the predominant nitrogenous waste product of protein metabolism. Recent studies report that fish inhabiting waters made alkaline by high concentrations of bicarbonate do not excrete ammonia - but rather urea, converting ammonia to urea in the liver. Since urea is energetically more costly to produce than ammonia, it is likely that urea synthesis is initiated in response to a specific environmental factor. In order to begin to identify this factor, we separated the contribution of high pH from the high bicarbonate concentrations often found in alkaline waters. Goldfish were acclimated for 5 days to media buffered with either 7.0 mM HCO_3^- and 4.0 mM tris or 4.0 mM tris alone. Media pH was varied between 7-9. The fish were fed high protein foods daily. We found that pH was the major determinant of nitrogenous waste product. Fish acclimated to high pH eliminated approx. 10 times the amount of nitrogen in the form of urea when compared to fish acclimated to low pH. At the concentration of bicarbonate used in this study, we found that this buffer was no more effective at stimulating urea production than tris buffer alone.

75

GENETIC DIFFERENTIATION AMONG POPULATIONS OF LARGEMOUTH BASS.
M. A. Nedbal and D. P. Philipp, Center for Aquatic Ecology, Illinois Natural History Survey, Champaign, IL 61820.

Using protein electrophoresis to assess genetic variation among 90 populations of largemouth bass, *Micropterus salmoides*, we have demonstrated fixed genetic differences between the two recognized subspecies, *M. s. salmoides* and *M. s. floridanus*. Although the pattern of allelic variation among populations also suggests the existence of multiple stocks within each subspecies, this analysis did not have the resolution power needed to clearly define them. Restriction fragment length polymorphism (RFLP) analysis of mitochondrial (mt) DNA often detects more genetic variability than that observed with protein electrophoresis. The purpose of this study was to assess the level of mtDNA RFLP variability in this species. Six populations, three each from both subspecies ranges, were analyzed using 16 endonucleases. Nine of the enzymes used to screen individuals generated banding patterns that differentiated the two subspecies. In addition, within each subspecies banding patterns varied with sufficient frequency to discriminate among populations, thereby demonstrating that RFLP analysis of mtDNA is capable of defining intrasubspecific largemouth bass stocks.

76

THE ROLE OF CUCKOLDER MALES IN SUNFISH HYBRIDIZATION.

B.R. Konkle and D.P. Philipp, Illinois Natural History Survey, Champaign, IL 61820.

The occurrence of natural hybrids among sunfishes (*Lepomis*: Centrarchidae) is well documented, yet little is known about the interactions between species which lead to F_1 formation. Current dogma concerning hybrid origins suggests that there is a breakdown in reproductive isolation due to "mistakes" being made by males and females. However, given that alternative male mating types that employ sneaking behaviors to steal fertilizations from nesting parental males occur in some, if not all *Lepomis*, we propose that cuckoldry may be a major mechanism of hybridization among these species. Employing a combination of molecular genetic techniques (protein electrophoresis, mtDNA RFLP analysis) and behavioral observations in a natural population of bluegill (*L. macrochirus*) and pumpkinseed (*L. gibbosus*), we have determined that the extent of hybridization is low (2-5%), hybridization between these species is unidirectional, and that bluegill sneaker males and pumpkinseed females are the parental types involved.

77

THE DACNINAE (COLEOPTERA: EROTYLIDAE) OF ILLINOIS, WITH NOTES ON THEIR DISTRIBUTION AND HOST PREFERENCES. M. A. Goodrich, Department of Zoology, Eastern Illinois University, Charleston, IL 61920. The Dacninae of Illinois are reviewed and their host fungi discussed. Three genera comprising eight species of Dacninae occur in North America: Dacne (5 spp.); Megalodacne (2 spp.); and Microsternus (1 sp.). Of these 8 species, 4 are believed to occur in Illinois: Dacne quadrimaculata, Megalodacne fasciata, Megalodacne heros, and Microsternus ulkei (not yet recorded for Illinois, but likely to occur). Although most species are not highly host specific, polypores are generally the preferred hosts. Distribution in Illinois and relative rarity of these species are described and numerous new host records are provided.

78

HABITAT PREFERENCES OF CRAYFISHES AND MUSSELS IN THREE SOUTHERN ILLINOIS STREAMS: A PRELIMINARY REPORT. J.M. Carmody and M.A. Phillippi, Southern Illinois University, Carbondale, IL 62901. Little is known of species richness, habitat preference and community structure of mussel and crayfish populations inhabiting streams of the Shawnee National Forest. Compilation of such data is timely, because Big Grande Pierre Creek (BGP), Hutchins Creek (HC) and Lusk Creek (LC) are being considered for federal designation as wild, scenic, or recreational rivers. Our purpose is to inventory crayfishes and mussels in these streams and determine their habitat preferences. Three different stations in each stream were sampled at approximately monthly intervals (April-October, 1990; 18 stations/stream). Oxygen, alkalinity, pH, turbidity and temperatures were measured at each station. Crayfish were sampled with six seine (3 sq mm) hauls (3 sq m each) per station. Depth, current velocity and substrate were characterized for each seine haul. Transects were established at each station and mussels were sampled in .025 sq m quadrats. Depth and substrate were characterized in each quadrat. To date, the crayfish Orconectes illinoisensis has been collected in LC and BGP and O. virilis in HC. Three mussel species have been collected in LC and BGP and none in HC. Information from this study will enhance our knowledge of habitat preferences and associated water quality characteristics necessary to maintain populations of two poorly known invertebrate groups. The information also will aid in determination of eligibility of each stream for National Wild and Scenic River status.

79

LABORATORY INTERACTION BETWEEN CHRYSOMYA RUFIFACIES AND COCHLIOMYIA MACELLARIA (DIPTERA: CALLIPHORIDAE), THE POSSIBLE CONSEQUENCES OF AN INVASION. J. D. Wells, University of Illinois at Chicago, Chicago, IL 60680. An Old World carrion fly (C. r.) was recently discovered in the U.S.A. Anecdotal reports have blamed Chrysomya spp. for displacement of native flies at several locations around the world. This study measured the interaction of C. r. and Cochliomyia macellaria, its presumed ecological homolog. C. r. was found to reduce C. m. survivorship at several densities and two temperatures.

80

A COMPARISON BETWEEN LEPOMIS SPP. FISH FROM ACID AND NON-ACID LAKES, BASED ON THE TRACE METAL CONCENTRATION OF MUSCLE TISSUE. E. N. Ratcliff, Southern Illinois University at Edwardsville, Edwardsville, IL 62025. This study was conducted to determine if the accumulation of trace elements by Lepomis spp. fish would be greater in an acid strip mine lake than in non-acid lakes. A southern Illinois acid strip mine lake (pH~3.5), neutralized strip mine lake, and reservoir were compared. Of 7 trace metals analyzed (Al, Cd, Cu, Fe, Mn, Pb, and Zn), only Mn, Zn, and to a lesser extent Pb varied significantly between fish from different lakes. Levels of all three metals were actually lower in the acid strip mine fish, despite much higher levels of Mn and Zn in the water. Tissue Cd levels were very consistent between lakes. Elevated levels of Ca^{++} and Mg^{++} in the acid strip mine lake may be protecting against the accumulation of some trace metals by the fish.

31

PRELIMINARY OBSERVATIONS OF TWO XERIC ADAPTED LIZARDS, TROPIDURUS PERUVIANUS AND PHYLLODACTYLUS GERRHOPYGUS, ALONG THE SOUTHWEST COAST OF PERU. W.L. Strond, Evanston Hospital, Evanston, IL 60201. The area of study extended north of the Tambo river near Mejia to the southern limits of the city of Islay (17°south, 72°west) during the month of February 1989. Along the rocks on the northern city limits of Mollendo a relatively narrow area of sympatry was identified between Tropidurus peruvianus and Tropidurus tigris which was suspected by Dixon and Wright in 1975. Tropidurus tigris preferred the larger rocks and steep slopes while Tropidurus peruvianus preferred smaller flat rocks on a level surface. In addition, this flat sparsely vegetated area supported the largest population of Phyllodactylus gerrhopygus observed. This location was adjacent to several brick factories which discard defective bricks and tiles over a wide area. All Phyllodactylus gerrhopygus were found near or under bricks and volcanic stones while Tropidurus peruvianus was almost exclusively found under or between rocks which tended to be granite rather than volcanic in composition. Along the coast and less than 100 meters from shore, south of the city of Mollendo, only Tropidurus peruvianus and Phyllodactylus gerrhopygus were seen. All lizards were seen less than 1 meter from dead avian or aquatic mammalian carcass remains. Internal examination of reproductive females (large maroon gular patches) revealed 2 large eggs per female.

82

THE USE OF TAIL BAND PATTERNS / RATTLE INJECTION (WITH PLASTIC PAINT) TO IDENTIFY AND MONITOR FERAL POPULATIONS OF WESTERN DIAMONDBACK RATTLESNAKES. W.L. Strond and R. Feldman, Evanston Hospital, Evanston, IL 60201. The dorsal and ventral tail band patterns from 506 adult and juvenile western diamondback rattlesnakes, Crotalus atrox, exhibited an extremely wide range of morphological diversity. Unlike other marking techniques (scale clipping, ink marking, and tagging) the use of these patterns offers the biologist a method to identify individuals in a population which is resistant to change due to growth, and wear and tear over time. Individuals from populations of 100 or less can be identified by both the number and type of the dorsal tail bands. The most common band types seen were: (1) Full. (2) Half. (3) Diagonal. (4) Offset Half. (5) Y. (6) H, and (7) L. In addition to these band types, stripes of varied width and length, as well as, spots were frequently observed. When an observer expects to examine populations greater than 100, a detailed scale by scale comparison has proven to be most effective at identifying specific individuals. The use of this method is limited to those snake species with stable coloration. Injection of plastic paint inside the proximal rattle segment proved to be of exceptional value in quantifying the number of times each animal shed. By cycling through a series of colors and frequently sampling the population biologists can also assess shedding rates over time.

83

AN EMPIRICALLY-BASED HABITAT SUITABILITY MODEL FOR GOLDEN MICE IN ILLINOIS. K. A. Furtak, G. A. Feldhamer, and P. A. Robertson, Southern Illinois University Carbondale, IL 62901. In the midwest, southern Illinois represents the periphery of the geographic range of the golden mouse (Ochrotomys nuttalli), and the species is considered to be threatened in the state. Golden mice in Illinois occur predominantly in Shawnee National Forest, where timber harvesting may have an adverse affect on them. The objective of this study was to develop an empirically-based habitat suitability model for golden mice in pine stands on Shawnee N.F. Live-trapping grids were operated on 21 sites in 1989 and 1990. Trapping grids were 0.5 ha in size and operated for 10 consecutive days. On each site, 27 habitat variables were measured. Habitat variables were used as independent variables in regression analyses, and in discriminant function analyses, to determine significant relationships with the occurrence of golden mice. Significant habitat variables were then used to construct a predictive model. Population characteristics of golden mice, associated quantitative habitat characteristics, and the model are discussed.

84

Estimation of the Deer Population of the SIUE Campus. A. Keele, E. Ratcliff, and F.B. Kulfinski, Southern Illinois University at Edwardsville, Edwardsville, IL 62026. Numbers of deer were obtained by means of spotlighting the deer and counting them. Numbers of deer/auto accidents per year were also obtained. The study was prompted by the high frequency of occurrence of such accidents and was carried out in March through June, 1990. The efficacy of estimating population size from spotlighting data and other sources is discussed.

85

SPATIAL DISTRIBUTION OF BACTERIA AND FUNGI ON THE RHIZOPLANE OF FIRST YEAR GARLIC MUSTARD (ALLIARIA PETIOLATA) PLANTS.
J. A. Meredith and S. S. Dhillion. Department of Biological Sciences, Illinois State University, Normal, IL 61761.
We used a root print technique to determine the spatial distribution of microbes on the tap root of garlic mustard. Lengths of roots used in this experiment ranged from 3 to 5 cm. Ten sequential root prints were made of the entire tap root (distil and root apex) by rolling the root on selected media. Total bacterial, fungal, and pseudomonad numbers, and colony forming units of chitin, protein, and cellulose decomposers were determined per square cm of root.

86

COMPARATIVE ULTRASTRUCTURE OF FIXED AND FREE CILIATED URNS IN SIPUNCULAN WORMS.
L.K. Dybas and G.M. Melendres. Knox College, Galesburg, IL 61401. Ciliated urns are multicellular complexes found swimming freely in the coelomic fluid or attached to the lining of the coelomic cavity. Some sipunculan species have both fixed and free urns, some species have only one type, while in other species, both types are lacking. Functional studies have implicated the urns in circulation of coelomic fluid and in internal defense but the importance of their role is questionable since many species exist without urns. Morphological data on urns is scant. In this study fixed urns of Phascolosoma antillarum are described by light and electron microscopy and compared to free urns of two Phascolosoma species. Phascolosoma urns are in turn compared to the fixed and free urns of Sipunculus nudus. The fixed urns of P. antillarum are Y-shaped, attached at the base of the Y. On each arm is a ciliated cell. A third cell sits in the depression between the two arms. Separate granulocytes, similar to those lining the coelomic cavity, may be associated with the arms. These fixed urns are similar to the free urns of other Phascolosoma and to the fixed urns of S. nudus. The free urns of S. nudus and Phascolosoma are very different. This finding questions the origin of free urns from fixed urns.

87

INDUCTION OF GLUTATHIONE S-TRANSFERASE ACTIVITY IN THE HOUSEFLY, Musca domestica, USING PHENOBARBITAL AND SODIUM BARBITAL.
S. A. McCommas and E. D. Boedeker, Southern Illinois Univ. at Edwardsville, Edwardsville, IL 62026

As part of a study to better understand the nature of insecticide resistance mutations, and the regulation of the GST gene family in houseflies, we attempted to induce higher levels of GST activity in a resistant strain. Individuals of this strain were fed 0.25% phenobarbital, 0.13% sodium barbital, and 0.25% sodium barbital dissolved in milk. Levels of GST activity were measured at days 0, 1, and 4. GST activity increased for each treatment during the course of the experiment, compared to a control line fed milk only. The increase was greatest for the 0.25% sodium barbital line; the 0.25% phenobarbital and 0.13% sodium barbital lines were roughly equal to each other. Levels of GST mRNA were consistent with the differences seen in enzyme activity, suggesting that the drugs act at the level of transcription.

88

THE EFFECT OF SODIUM IODATE ON MELANIN. Annette Baich and Michelle Ziegler. Southern Illinois University at Edwardsville, Edwardsville, Il. 62025. Sodium iodate is a known cytotoxic agent, selective for the retinal pigment epithelium (RPE). However, its mode of action, and specificity is not understood. The RPE has some characterisitc(s) that make it particularly sensitive to sodium iodate. One characteristic of the RPE is that this tissue contains a very high concentration of melanin. Melanin has been previously shown to mediate the production of glyoxylate from glycine in vitro. We found that sodium iodate increases glyoxylate production from glycine in the presence of melanin. The effect is dependent upon the concentration of sodium iodate and is produced linearly over 24 hours. Extracts from this natural melanin produce glyoxylate from glycine, bind DNA, and effect cell viability of fibroblasts and RPE cells.

89

NEW CHEMICALS FOR FINGERPRINTING: PYRAZINE ANALOGS OF NINHYDRIN AND DFO. F.J. Frank and B. Borup, Illinois Wesleyan University, Bloomington, IL 61702.

Several structural analogs of ninhydrin and DFO (1, 8-diazafluoren-9-one) with a pyrazine ring have been synthesized and reacted with amino acid in solution, on paper and with fingerprints on paper. None of the DFO analogs reacted as readily as DFO or showed as much fluorescence as DFO. The ninhydrin analogs reacted to give purple color similar to ninhydrin.

90

NEW CHEMICALS FOR FINGERPRINTING: PYRAZINE ANALOGS OF NINHYDRIN AND DFO. F.J. Frank and A. J. Carr and K. L. Hund, Illinois Wesleyan University, Bloomington, IL 61702.

The pyridine ring has been used to prepare several structural analogs of ninhydrin and DFO (1, 8-diazafluoren-9-one). These analogs have been reacted with amino acid in solution, on paper and with fingerprints on paper.

91

EARLY HOLOCENE FOREST REMAINS DISCOVERED ON THE FLOOR OF SOUTHERN LAKE MICHIGAN. F.A. Pranschke and C.W. Shabica, Northeastern Illinois University, Chicago, IL 60625, and M.J. Chrzastowski, Illinois State Geological Survey, Champaign, IL 61820. In June 1989, salvage divers discovered a localized occurrence of tree limbs, trunks and stumps in growth position in southern Lake Michigan about 25 km east-southeast of Chicago Harbor. The site, now called the Olson Site, covers about 8500 m^2 in 24 to 26 m water depth. The rooted stumps range from 15 to 75 cm diameter and stand up to 1.2 m high. The lake bottom is low-relief (0.5-1.0 m) ridges and troughs of gravelly silt and very fine sand that veneer a silty clay. Three stumps have been sampled for tree identification and radiocarbon dating. An oak was dated at 8,120 ± 100 yBP (ISGS-2036) and 8,380 ± 100 yBP (Beta-34357). An ash and another oak each gave dates of 8,320 ± 70 yBP (ISGS-2095; ISGS-2096). The dates are consistent with the trees growing during the early Chippewa Low phase of ancestral Lake Michigan (Lake Chippewa), and drowned during the subsequent lake-level rise (Nipissing transgression). The discovery provides an unprecedented benchmark for studies of lake-level history and lakeshore paleogeography. Preliminary interpretation is that the trees occupied a forested wetland marginal to a stream that flowed to Lake Chippewa.

92

AN ENIGMATIC GLACIO-FLUVIAL DEPOSIT IN WEST-CENTRAL MERCER COUNTY,ILLINOIS. R. L. Welch and L. A. Wiedman, Department of Geology, Monmouth College, Monmouth IL. 61462.
Between the Edwards River and Camp Creek, two miles north of Joy, IL. quarry activity has exposed glacio-fluvial sediments which contain a range of clast sizes from boulders larger than 150 cm in diameter to silt size loess. This generally fining upward sequence has been observed to contain very little clay among the relatively coarse grained, cross-bedded sediments indicating high flow regime conditions. The sediments are believed to have been deposited very near the ice margin during the Illinoian ice advance, however specific environments of deposition are still enigmatic. A possible older soil horizon can be seen below the Illinoian deposits.

93

WETLAND RESTORATION/MITIGATION AT SAVANNA, ILLINOIS. Cassandra S. Rodgers[1] and Patrick A. Malone[2]. [1]Illinois Department of Transportation, 819 Depot Ave., Dixon, IL 61021; [2]Illinois Department of Conservation, 524 South Second St., Springfield, IL 62706. The Illinois Department of Transportation, District 2, completed restoration of a 30-acre wetland site (10.6 acres of shallow water and shore zone) near Savanna, northwestern Illinois, in 1989. This wetland was designed to mitigate 5.2 acres of wetland impacted during the replacement of the deficient structure carrying Illinois 84 over the railyards in Savanna. The site includes a shallow zone of 1 to 1.5 feet of water, a deep zone of 8 to 25 feet, and a prairie buffer zone. The shallow zone was planted with rootstocks of 16 species of hydrophytic plants. The shore zone was seeded with 22 native species. The prairie buffer zone was designed to blend with an existing grove of bur oaks and wildlife habitat. Seeds and plant materials were obtained from sources within the project region. This wetland site is adjacent to the Upper Mississippi River Wildlife and Fish Refuge and will therefore extend this existing natural habitat. Besides providing an important wildlife habitat, this area may be used as an educational tool to demonstrate the importance of wetlands.

94

LANDUSE CHANGES IN CHAMPAIGN COUNTY OVER THE PAST 30 YEARS.
D. L. Szafoni, C. Nixon and L. L. Osborne. Illinois Natural History Survey, Champaign, IL 61820. Current land use patterns in the six major watersheds in Champaign Co. were compared to historic vegetation patterns to assess the changes over a 30 year period. Watershed boundaries were digitized from the most recent 7.5 min. (1:24,000) U.S.G.S. topographic maps. Land use patterns were interpreted from aerial photographs (for current land use) and 15 min. (1:62,500) topographic maps (for 30 year old land use) and digitized using the Illinois Arc/Info Geographic Information System. The land use classification system was a modified version of the LUDA system (Anderson et al., 1976). Six general categories were employed: urban and built-up land; agricultural land; forest land; water (lakes, reservoirs and streams); wetlands; and barren lands (e.g. mining areas). The percentage of each land use type was determined for both the present and historic periods. An assessment of the land use and vegetation pattern changes over the past 30 years was made.

95

A COMPARISON OF VENOUS OCCLUSION, STRAIN GAUGE PLETHYSMOGRAPHY TO MEASURE CALF AND FOREARM BLOOD FLOW IN RESPONSE TO ICE WATER IMMERSION. **R. J. Baker, University of Illinois, Urbana-Champaign, IL. 61801.** **Forearm and calf blood flows were measured before, during and after immersion of the hand and foot in ice water. Blood flow measurements were compared between impedance plethysmography and venous occlusion, strain gauge plethysmography, over two trials. Blood pressure and heart rate were measured during immersion to verify that the cold pressor response did occur. The subjects were young (24±3 years of age), healthy, male volunteers. They immersed their foot in ice water for two (2) minutes, during which blood flow in the upper extremities was measured. When they immersed their hand, blood flow in the lower extremities was measured. Analysis by MANOVA showed no significant difference between trials. Both upper and lower extremities responded with a linear decrease in blood flow. There was no significant difference, in these trends, between the two methods. It was concluded that impedance plethysmography is a reliable method for estimating blood flow responses to cold water immersions of the hand and foot.**

96

PHOSPHOINOSITIDE ANALYSIS DURING THE CELL CYCLE. C. Hendrell and P. Wanda. Southern Illinois University at Edwardsville. IL 62026-1651. Mammalian cell growth and differentiation are cell-cycle dependent events that have been associated with the metabolic turnover of inositol phospholipids. Utilizing human erythroid K562 cells, we have found that cells synchronized at specific phases of the cell cycle have a differential content in their inositol phospholipids. Cells were synchronized into specific cell cycle phases by manipulation of serum content in the growth medium and addition of hydroxyurea, an agent that reversibly blocks DNA synthesis. Cellular phosphatidylinositol was radiolabeled by addition of tritiated myoinositol to the growth medium prior to serum deprivation. Growth kinetics and cell viability was determined by trypan blue exclusion tests. Phospholipids were extracted by perchloric acid treatment and analyzed by liquid scintillation counting after separation in a Biorad AG1-X8 chromatography column. The G1 phase of the cell cycle showed 59% of the radioactivity in the phosphatidylinositol fractions. At the G1-S phase, 61% of the radioactivity was in the inositol triphosphate fractions, while in the S phase of the cell cycle, 57% of the radioactivity was present as inositol biphosphate. Phosphoinositide content clearly changes during the cell cycle.

97

PROGRESSION OF PROTOZOAN SPECIES WITHIN AERATION BASINS OF AN ACTIVATED SLUDGE WASTEWATER TREATMENT FACILITY. J.L.Roberts and P. James Nielsen, Western Illinois University, Macomb, IL 61455. This study takes an in depth look at the aeration basins of the Macomb Wastewater Treatment Plant. Samples were collected for three months during the summer of 1989. BOD (biochemical oxygen demand), OUR (oxygen uptake rate), and TS (total solids) values were determined for the beginning, middle, and end of the aeration basins. In addition an enumeration of protozoan and metazoan species was performed and BOD's for the clarifier and final effluent were recorded. OUR decreased from the beginning to the end of the basins, while BOD's and total solids remained the same. Crawling protozoans, Aspidisca costata in particular, were the predominant ciliates present, followed by the stalked forms such as Vorticella microstoma, Zoothamnium pygmaeum and Epistylis plicatis. Community similarity studies showed little difference between the three communities. BOD values for the final effluent remained good throughout the study despite a severe disturbance in the protozoan numbers following two days of wasting.

98

OSTEOLOGY OF DARTERS.
R. R. Stephens, Bradley University, Peoria, IL 61625, and L. M. Page, Illinois Natural History Survey, Champaign, IL 61820.
The branchial baskets of seventeen species of darters in three genera and twelve subgenera were examined. Significant interspecific variation was found in the presence or absence and size of the interarcual cartilage and in the shape of epibranchial 1. Among species examined, three character states were found for the interarcual cartilage and four character states were found in the shape of epibranchial 1.

99

SUBSPECIFIC STATUS OF REGIONAL ILLINOIS DEER HERDS
Jeffrey M. Levengood, Alan Woolf, and John L. Roseberry Cooperative Wildlife Research Laboratory, Southern Illinois University, Carbondale, IL 62901
Illinois is included within the range of the large northern woodland white-tailed deer (Odocoileus virginianus borealis). Recent studies have suggested that deer from southern Illinois may be assignable to the Virginia white-tailed deer (O. v. virginianus), based upon the smaller size, yet high productivity and good physical condition of deer from this region. Morphometric relationships of adult female O. virginianus from Illinois were examined using discriminant function analyses of craniodental and external characters, in order to test the hypothesis that deer from southern Illinois are morphologically distinct. The first discriminant function in each analysis separated southern Illinois specimens from those collected in northwestern, westcentral, and central portions of the state. Southern Illinois specimens averaged smaller for all distinguishing variables. Classification results were consistent with these findings. Graphic illustration of mean body weight (by county) revealed that counties occupying the southern third of the state were characterized by "below-average" (less than one S.D. below mean) deer.

100

THE REMARKABLE LONGEVITY OF BOX TURTLES. Robert E. Johnson, Richard Elghammer, and Donald Beyer, Knox College, Galesburg IL 61401, and the University of Illinois, Urbana IL 61801. As a species, box turtles (Terrapene carolina)preceded the dinosaurs and have long survived them. Several characteristics may contribute to their evolutionary success. First, individuals are long lived, with authentic records of over 100 years. Second, in the U. S. Registry of Veterinary Pathology malignant neoplasia is recorded for many reptiles, including snakes, crocodiles and marine turtles, but none for box turtles. Third, they can withstand starvation for weeks or months, although they are omnivorous when food is available. We have found nitrogen fixing bacteria (Azotobacter)in their excreta, a most unusual finding for any vertebrate.

101

ILLINOIS WOODLAND RAPTOR SURVEY. P. L. Malmborg and G. C. Vanderah. Illinois Natural History Survey, Champaign, IL 61820. The Illinois Natural History Survey is coordinating a two-year statewide survey of nesting woodland raptors for the Illinois Department of Conservation. Twelve study areas were surveyed in 1990 using a census technique from a similar study conducted by the Indiana Department of Natural Resources. Census routes were surveyed by broadcasting a great horned owl call to elicit defensive behavior in nesting raptors. Objectives of the study were twofold: to estimate the abundance and distribution of nesting woodland raptors in Illinois and to evaluate the effectiveness of the census methods, which could offer a quick yet reliable way of monitoring nesting raptors. Twelve raptor species were recorded throughout the state during April through July 1990. Raptor response to the great horned owl call varied among the recorded species. This study will be repeated in 1991 to test the reliability of the method.

102

THE EFFECTS OF UNFAVORABLE MEDIA IN FLOUR BEETLE POPULATIONS. S. Kotomatas, University of Illinois-Chicago, Chicago, IL 60680. Extensive work on the dynamics of Tribolium populations has demonstrated that under standard conditions such populations are regulated in numbers. I investigated whether, under suboptimal conditions, populations of Tribolium castaneum and T. confusum are regulated and I identified the possible mechanisms of regulation. The 3 media used were standard flour, nutritionally depleted flour and conditioned flour (i.e. used by beetles for 3 months). The results of a one year experiment show that under the 2 unfavorable conditions the equilibrium adult number (80 adults/vial) was much lower than under standard conditions (220 adults/vial). The mechanisms of regulation under unfavorable media were found to involve an increase in cannibalism of adults on eggs, a lowering of fecundity and an elongation of developmental period. It is evident that, even though the mechanisms of regulation operate similarly in all 3 media, the effects are intensified under unfavorable media.

103

DIET CHOICE AS A MECHANISM OF COEXISTENCE IN SCIURID RODENTS. D.M. Jedlicka, University of Illinois at Chicago, IL 60680. Species coexistence is a central question in community ecology. Foraging theory can be used to deduce conditions for species coexistence in a community. Diet choice/food size selectivity is one possible mechanism of coexistence. A community of varying sized sciurid rodent species was observed foraging in manipulated patches during summer 1990. Different sized food resources (whole husked sunflower seeds and crushed husked sunflower seeds) were recovered from foraging patches. The smaller species forage more efficiently on smaller food resources while the larger species are less efficient on the smaller food resources.

104

THE SIGNIFICANCE OF FOSSILS IN SYSTEMATIC AND EVOLUTIONARY RESEARCH. T. C. Grande, University of Illinois at Chicago, Chicago, IL 60680. The usefulness of fossils in systematic, evolutionary and biogeographic studies has been questioned, resulting in a polarization of these fields and much heated debate. In this paper I will address this controversy, but focus on the contributions fossils can make to systematic and biogeographic studies (i.e. setting a minimum age for a taxon, contributing information about the biogeographic pattern of a taxon, helping to describe the paleoecology of an area).

105

VALUE OF MUSSEL BEDS TO SPORT FISHERIES. Philip B. Moy and Richard E. Sparks. Illinois Natural History Survey, Forbes Biological Station, Havana, IL 62644. Freshwater mussels must parasitize a fish in order to complete their life cycle and some species actively attract host fish with mantle flap lures. To determine if sport fish prefer mussels over other substrates, sport and forage fish species were given a choice of two substrates in tanks monitored by image digitizing cameras linked to personal computers. Sand was compared to mussels and rocks colonized with invertebrates, and clean mussels and rocks. The cameras and computers monitored the position of the fish in the tanks and regression analysis indicated whether the fish exhibited a preference for any particular substrate. Bluegills, fathead minnows and young largemouth bass significantly preferred mussels colonized with invertebrates over other substrates. In alluvial rivers where rock and gravel can be buried by silt, mussels maintain their position with a portion of their shell exposed and provide firm substrate for attachment of insect nymphs and larvae. These small forage organisms may attract forage fish or young sport fish which in turn attract larger fish. Methods and results of laboratory preference trials are presented in a poster accompanied by a video of a mussel mantle flap display.

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(20 August 1990)

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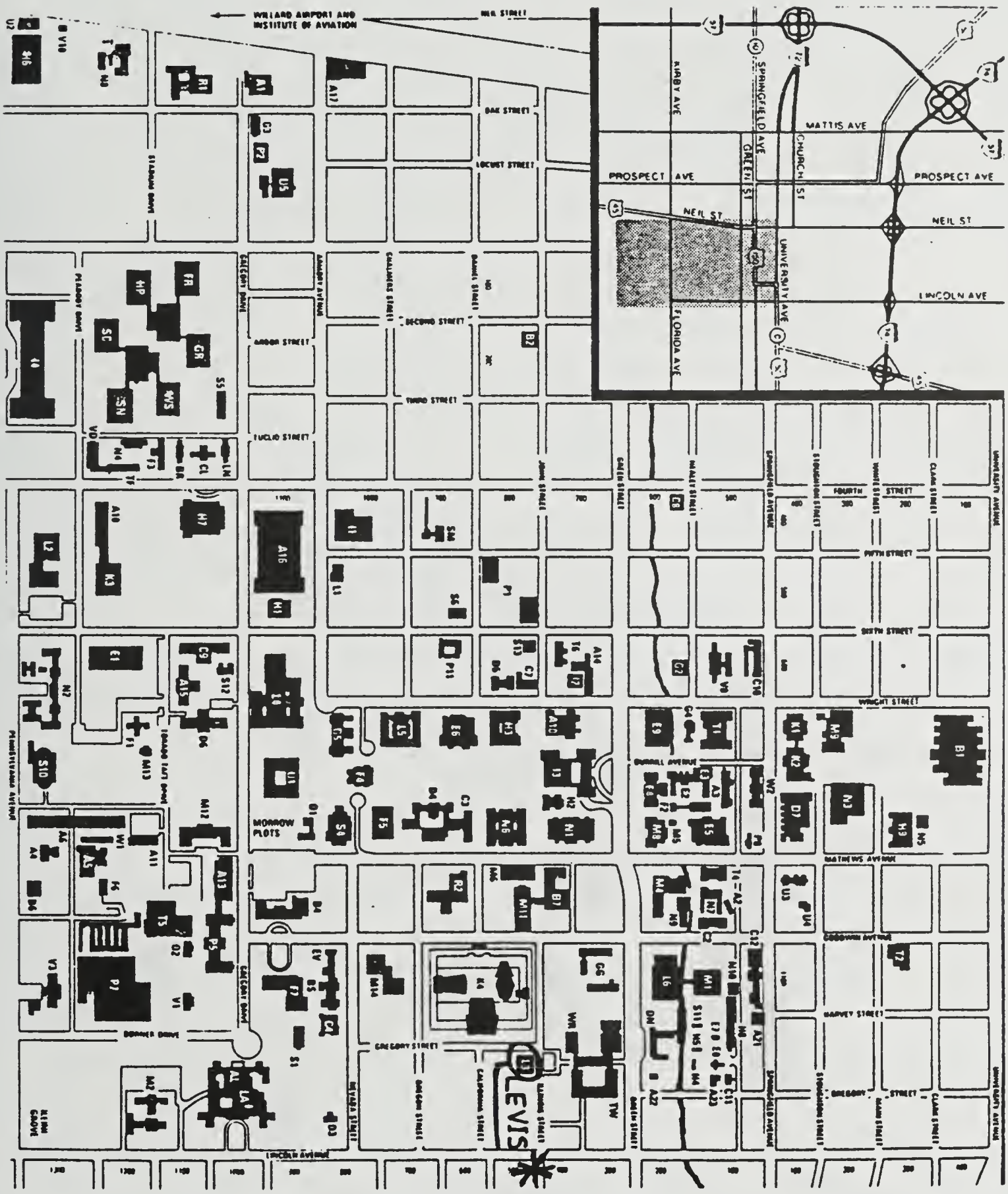
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